

37-12-79.

The Mystery of ASTRONOMY Made plain To the meanest Capacity,

BY

An Arithmetical Description of the Terrestrial and Celestial Globes.

Briefly shewing (by way of Question and Answer)
the wonderful works of God, from the earth
his Footstool, to his Throne of heaven.

With Divine Observations upon every part thereof.

Also, Two TABLES: the one, for Contents; the
other, for Explanation of Hard words.

By *W.B.* an honourer of ARTS & SCIENCES.

Jer. 10.12. *He hath made the earth by his power, he hath established the world by his wisdom, and hath stretched out the heavens by his discretion.*

Psal. 111.2. *The works of the Lord are great, sought out of all them that have pleasure therein.*

Psal. 9.1. *I will shew forth all thy marvelous works.*

I have leisurely perused this Treatise, intituled *The Mystery of Astronomy, &c.* in which is contained much variety of most excellent Learning: I do conceive it very worthy the publike view, and do willingly give my approbation thereof.

Sept. 25. 1654.

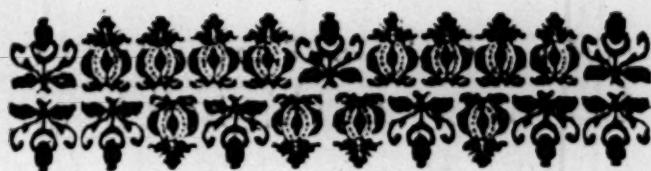
Imprimatur.

JOHN BOOKER.

London, Printed by J. Cottrell, for Will. Larmer, at the Blackmoors head neer Fleet bridge. 1655.



23804.11



To the Great Example
of Fidelity to the Dead,
And of ingenuous goodness to
all men Living,

Thomas Bushel Esquire,
Inheritor of the vertues of
his most noble Lord
Sir Francis Bacon.

Honored Sir,

B serving your firm
resolution, and un-
wearied endeavors,
to fulfil those glorious com-
mands of your admired Lord
and Patron Sir *Francis Ba-*

The Epistle

con, (the great Advancer of Learning, and highest honor of our English Nation) in laying the foundation of his much - desired COLLEGE ; where he proposed to himself, as his greatest happiness (next heaven) to have all Arts and Sciences not onely improved, but converted to true use and wisdom.

It being a portion of Felicity I could not hope for, to be as it were raked out of the dust of Obscurity, by your most clear and ingenuous goodness, and to have my weak skill in Arts so highly regarded, and my long-neglected Labours (in my Arithmeti-

Dedicator.

metrical observations & proportions upon the Terrestrial and Celestial Globes, visibly demonstrated in my Spheres) so honoured, as to be made the first stone to so eminent a Fabrick; it gave me encouragement, and set me on this work, to discover the true use thereof, that God might be glorified thereby, and all men be made wise and judicious in the knowledge and consideration of his most wonderful works.

Which being perfected, in due thankfulness, and true honour to your vertues, I dedicate the same unto you, as being willing to speak your just

The Epistle, &c.

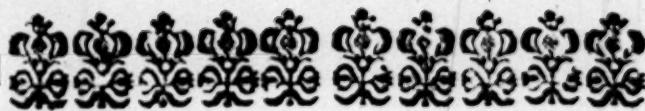
just praises to all posterity, that after-ages may know they owe the benefit of this Discourse, and of my Model of the Spheres (the first of this kinde) to your name ; but for whose industrious goodness, and searching spirit, it might have been still buried in oblivion.

Sir, for all your Favours, which are more then I shall here express, I must ever subscribe my self

Your humble Servant,

Will. Bagwell.

The



The Occasion and Induce- ment to this WORK:

Published by the Author, to the end
that by observation thereof, men in
high and prosperous estate may not
presume, nor in lowe condition de-
spair ; but through meekness, wis-
dom, and patience, turn all to the
best, that is, to Gods glory.

Being bred a Merchant in
good quality, skilfully fur-
nished with knowledge in
all things necessary, and ha-
ving seen the world abroad,
and settled my correspon-
dence in many considerable places ; having
full and compleat trade for some yeers,
credit at will, my self, wife and children
having plenty with contentment, * and * Prov.19.
berewithal friends in abundance, my kin-
red also and my acquaintance being full
of protestations of most zealous affection ; I
was taken up wholly either with busines, or
invi-

invitations, pleasing my self sometimes in Musick, sometimes in the Mathematicks :
* Acts 17. and though never extravagant, * yet be-
21 tween whiles in chat, & fruitless discourses, News, and as vain and various subjects. Swimming in this jolly condition, as a man of this world, seldom seriously, but rather cursorily applying my thoughts on the things of God ; I was in a moment made to know, I was born to other purpose.

And although I muster'd up all the strength I was able, and made head a long * Pro. 6. 11. time against it, yet * poverty came on as a mighty man, and would have no resistance, * Ch. 23. 5. and * riches made to themselves wings, and flew away far faster then they came : my crosses came not alone, but in heaps upon me, * Job 1. 16, and thick, * one in the neck of another : at 17, 18. first, great losses beyond the seas, occasioned by the difference between our Nation and the French ; then some losses at sea, and the failing of many debtors ; and then my credit somewhat questioned upon the Exchange ; and soon after, scrupled beyond Seas : and therupon, (the bane of falling Merchants) the perfidionsnes of my Factors in delaying returns, creating difficulties and disputes, multiplying uncomfortable Letters, but parting neither with goods nor money. Some of which symptomes of a crazie estate, I hid as long

could ; and in some cases I opened
e to such of my friends, in whom I
confidence, and * from whom, for ^{*Psa. 41.9.}
done them, I had most deserved ;
or sh musick, it * found no ear, or ^{*Pto. 19.7.}
did, it begot nothing but frowns,
ding countenances. No help then,
usurious rates, or triple pawns, and
erve a present turn, or stop a gap,
festered wound, that by the evil
f the salve was certain to be worse
days.

thus I pudthered my self, till Ar-
e shame whereof I shunned more
b) came thick upon me, so that I
ble to stir abroad, or look out of
but I was sure to be catch'd. To
sons I got bayl, and went on with
law; a bleeding and consuming
en the worst that could be; which
e at length so dry of moneys, that
itned to provide food for my dis-
family; which was the grief of
the sight of my dear wife and chil-
drenly the joy of my heart, became
breaking: sleep, and food, and
rest, forsook me; and when I made
my quondam-friends, like ^{*Job's} ^{*Job 16.2.}
s, began to upbraid me: all my
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remedy, even the worst that could be; which
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I was straitned to provide food for my dis-
consolate family ; which was the grief of
griefs. The sight of my dear wife and chil-
dren, formerly the joy of my heart, became
my hearts breaking : sleep, and food, and
taking of rest, forsook me ; and when I made
my moan, my quondam-friends, like ^{Job's} ^{Job 16.2.}
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In this sad and dismal condition, musing
with my self what course I should take to
* Ch. 3. 25. prevent further trouble, * which I much
feared, I was arrested and carried to prison;
where, after a while, having neither money
to discharge the house, nor to provide me of
necessaries to subsist, my thoughts were not-
withstanding a little diverted from poring
too much on my distress of spirit; and so
falling into a slumber of some continuance,
I awaked in patience and much comfort:
and as a testimony of Gods love towards
* Gen. 59. me, * he gave me favour in the eyes of my
21. prison-keeper, so far as I was quit of taking
care of satisfying the charge of the house:
* Act. 28. 2. and divers worthy men, * whom I had ne-
ver in the least obliged, became my friends,
soliciting both me and my family, till God
took all but one from me; which also he gave
me patience to bear. So that the thoughts to
be in prison, and out of prison, and in again,
hath been my portion above these twenty
* Piat. 37. years, * yet have I never wanted my daily
25. bread; for which I shall ever bless God, and
thankfully remember their kindness who
were his instruments of love towards me.
But being fast closed up at length for con-
tinuance, I strove no longer, but gently sub-
* Act. 21. mitted my condition * and my will to the
24. will of God, considering with my self which
way

way possibly I might be instrumental in the
advancing of his glory: wherefore making
that prison my Colledge,* I became studious *Pro.8.12.
in the Art of Arithmetick, and in some
few yeers composed a Work intituled The
Mystery of Arithmetick, (not yet publish-
ed:) a Work very useful, profitable, and de-
lightful to people of all degrees and callings
whatsoever. And afterwards (* being free *Psa.88.8.
from the cares I formerly had, and from the
courteous visits of friends, who were then
as strangers to me) I applied my self to the
study of this Arithmetical description of
both the Globes; in which kinde of study I
was so delighted, that I could give my self
no rest until I had compleated the same as
well as I could in that place of restraint.
But when it pleased God I was thence deli-
vered and set at liberty,* I was by some no- *Nal. 37.
bле friends put upon some good employment,
whereby I was the better enabled to give the
Work that lustre, with some small glimmer-
ings of beauty, and resemblance of glory,
which I thought it worthy of; and which be-
ing (by some spectators) made known to Di-
vines, and to persons of greatest skill in A-
stronomy and in the Mathematicke, and of
the learned in all Arts, they so highly esteem-
ed and approved thereof, as they judged it
most worthy to be placed in some eminent

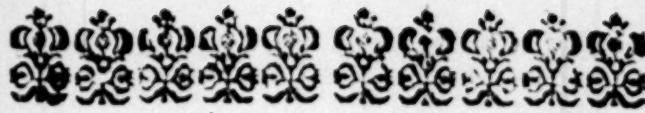
Univer-

University, Colledge, or Library, for the general good of Students, & others delighted in such noble Sciences, as tend so exceedingly to the advancement of Gods glory.

* 1 Cor. 10. 31. And therefore being thus encouraged, I have long waited for some fair oportunity; but have found none so acceptable, as the erection of Sir Francis Bacon's Colledge, intended to be established in Lambeth-Marsh neer London, where God willing it shall remain as a testimony of my zealous affection to the furtherance of so worthy an Institution for the advancement of Learning.

* Prov. 9. 9. But considering that this my Work could be but in one place, where though many may be bettered by the sight thereof, yet the knowledge it imported concerned all mankinde; therefore I conceived it my duty to proceed further, in dispersing the same by familiar Questions and Answers, and to raise such an Observations thereupon, as I had found most profitable to my self: which this Book presents you withal, to the end that God, even so by the meanest capacity, may be glorified in his works, that man may be truly humbled, and the name of the Lord exalted through out all generations.

* 1 Cor. 33. 5. Your well-wishing friend,
Will. Bagwell
Ex fructu cognoscitur arbor.



To the Good-natured Christian READER.

Wonder not that I am willing to finde my Readers thus qualified, that is, good-natured Christians ; one without the other in no measure answering my desires. I would finde them so, for mine own sake : for then I should be sure to have these my endeavours not onely kindly accepted, but improved by them to the glory of the * God of Nature, Heb.2.15 and to the praise of * the Father of our Rom.15.6 Lord Jefus Christ. And those I finde not such, I would yet gladly leave them so qualified, before they enter upon the ensuing Discourse, or well prepared towards so happie a composure of spirit. To which end, I shall pray them in the first place seriously to weigh what our Noble Advancee of Learning hath observed touching goodness of Nature : " Goodnes (saith he) I call the habit ;

B

" and

“and goodnes of nature, the inclina-
“tion. This of all vertues is the grea-
“test, and without which, Man is a mis-
“chievous, busie, wretched thing, no
“better then a kinde of vermine.

Another (excellent in wisdom) was
so transported in affection to it, that he
affirms, that God gives not the know-
ledge of his love in Christ to any, but

* Röm. 13. 14. such as cherish good nature in them-
selves.

However, this I conceive is
certain, that Christian Religion never
shew's so gracious, as in good, wise, and
considerate people, such are good-na-
tured. So that where this happie mar-

* Joh. 4. 10. tage of a benigne nature, and the
knowledge of the love of God in Christ
is made in one person, such do I wish all

* Luk. 8. 15. my Readers, such I esteem good and
clear-minded Christians, and such alone.
Therefore, whoever you are, content
not your selves with the one, without
the other; but labour by all good means
to attain and grow strong in both, there
being great scarcity and want of such
in this generation.

* 2 Tim. 3. 3. That meer men should be without
natural affection, the Apostle deemed
worthy of a sharp reproof. But men
taking the holy Scripture for their Rule,

to profess the Name of Christ, and to march in a * form of Religion, and yet ^{Chap. 2.5} not to arrive at so much sweetnes of conversation, as what good nature doth imprint or dictate, doubtless is most shameful: yet such(if good men are not very much mistaken) is the sad condition of many in our times.

Religion and Christianity never indeed more in discourse: but for * gentleness, and * brotherly kindnes, and ^{* Gal. 5.22.} plain-dealing true-heartednes, * self-denial, and to be tenderly affectioned one towards another, alas, where is it? * Where is that orderly respect to age, ^{* Levit. 19.} and just relation, as ought to be? What ^{* 1 Pet. 1.7.} is become of love to persons for goodness sake? Where are those that lay out themselves for the advancement of true knowledge and understanding, or in other necessary and useful works? Whither is fled * that softness and mildnes of spirit that adorns a Christian? What ^{* Luk. 9.23.} soberity and moderation in speech, which makes way for truth? Where is that bearing and forbearing one another in love?

Be there but a Dispute or Controversie in some high points in Divinity at any place to be discussed, (as if Religion

confined onely in words) multitudes
run hattily thither: but there also their
folly is soon made manifest ; suddenly
engaging, and taking sides , in such rug-
ged, unseemly, clamorous, course beha-
viour, as would not be seemly at a Mar-
ket. And what is the reason , but the
general want of keeping such Rules
and Observations as Nature it self doth
continually advise ? Such Christians as
those , have not studied nor considered
• Jam. 2. 14 what Good Nature is ; but whilst they
boast of faith and divine knowledge,
are defective in discretion.

And should such as these (whilst
such) take this Discourse in hand, with-
out or before an alteration begotten in
them by this preparative , What would
it profit them ? Certainly it would but
puff them up, as other Discourses
and as even the Scriptures often do
• Jer. 16. 10 without any favour of good wrought
in them, nor they one tittle the bette
for it , and but onely puff them up, fur-
nishing their after-discourses with flow-
ring stories of the wonders they find
herein, meerly for ostentation-sake : a
service I should be sorry my Labours,
how mean soever, should be put unto.

And therefore , to meet with these
ill-

ill-natured, or ill-nurtured Christians, (if the name of Christians they at all deserve) is the principal intent of this Epistle, as foretelling them the hardest to be wrought upon by the ensuing Discourse; their slightness, and want of consideration, rendering their consciences somewhat worse then tensles, inclining rather to the *Laodician* temper of *Rev. 3:14,* neither hot nor cold, luke-warmness *15, 16.* and neutrality in zeal and affection: a thing loathed of God, and detestable to all good men.

But if through this quickning preparative, (for such it is intended) they shall in the due fear and awe of God, with clearnes of minde and spirit, read the ensuing Discourse, and lay to heart his wonderful works therein appearing, it is very much to be hoped, that the consideration of those his marvelous works of Nature, so orderly and wisely disposed, may further sway their consciences into a self-examination and enquiry, wherein, and in what particular, even according to Natures light, themselves, though Christians, may be yet to seek, and out of course; and prove an equal means to rectifie their judgments, and to perfect their conversations for

the future ; and so they may become
a real honour to their holy profession,
* Psal. 9.1. and be made * fit publishers of the prai-
ses and mighty works of God : which
is the hearty desire of

Your faithful friend,

Will. Bagwel.

¶¶¶¶¶¶¶¶¶¶¶¶¶¶¶¶

To

¶¶¶¶¶¶¶¶¶¶¶¶¶¶¶¶



To his ingenious and true friend
Mr. W. B. upon his *Arithmetical
ASTRONOMY.*

When God corrects, his Rod to kiss,
The ready path is unto bliss;

And then to know what is his will,
Is the next step so holy skill.

This way my pious friend here took,
As witnesseth this useful Book.

A Work proceeding from a heart refindē :

Afflictions furnace is of heavenly kinde ;

Where this was wrought to such a height,
As now comes forth the worlds delight,
And such as ne'er was seen before :
So perfect is this golden Ore.

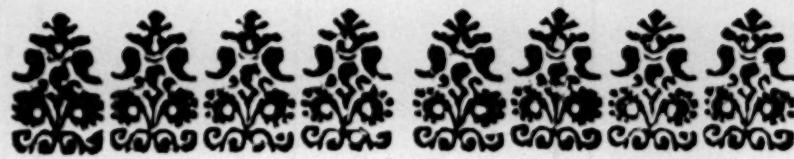
And now I joy, who long was sad
At those great sorrows you have had.

For you such Merchandise do here bring forsh,
So rare, so glorious, and of so great worth,
That when I judg'd you worse then dead,
You in your grave were quickened.

With purest zeal, you did convert that Art
Which in a Merchant is the chiefest part,
From being exercis'd on fading wealth,
Wh.ch most endanger doth mans saving health,
That you by us shew in numbers even,
Such wonders as do fix our thoughts on heav'n;
Finis'ing such worth in earth, seas, air, and fire,
As e'en of force, forceth our souls up higher,
And higher still, till daz'd with the glory,
We make a stima, and then admire the story
Of such a world of wonders. Looking back
Then on our seives, it makes ambition crack,
And shuns our selves but worms, meer vanity :
Then heart we take, from our humilitie,
That's Egle-sighted ; none dares fl.e so high,
None to the throne of grace dares come so high.
The Work doth work that best, made to that end.
Befriend him all, who to all's such a friend.

W. W.

To



To the Author, upon his Celestial Arithmetick.

What shall I say? how high shall be my note
To warble forth thy praise? I doubt my
Cannot attain to Ela: I wax hoarse (throat
Already, as I view thy counting course,
And thy ingenious fancy, to pour it ray
From sands to stars a plain and pleasant way.
Thou mak'st our journey short, and yet we ponder,
We contemplate, we wander, and we wonder,
Hearing thy Questions, Answers: then we muse
On what w' have read; and straightway what en-
We do enquire of, to be jogging on: sus
We make much haste, not minding what was
We wonder as we wander in our way: (done.
We oft stand still, not knowing what to say.
Then are our souls with holy ecclastie
Pestil: and what before we passed by
Regardless, through supinest negligence,
Quickned by what th' hast offer'd to our sense,
We

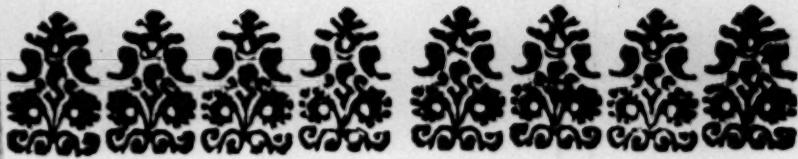
We more exactly mark, and running o're
This so vast frame, the builder we adore.

Thus hast thou wrought in every minde that
(reads)

Thy Book, an immaterial world that feeds
The pious soul, leading him up through all
The Sphears, which we Gradations may call,
To Heaven it self, that certainly must be
As highest, so, supream in dignitie,
Space, bulk, circumference, beauty, excellency,
As that which is the Throne of the Immense.
Hither thou lead'st us, where I hope to be
Endeniz'd one day, my dear friend, with thee.

John Booker.

To



To the ingenious Author of his
exact and elaborate Treatise of Arith-
metical Astronomy, Mr. W. B.

The design's good; man must lay down his
proud
And haughty claim, and past ambition shroud
Under sh' excuse of shallow Ignorance,
Lab'ring his almost-nothing to advance.
Whilf he had but a gen'ral and gross sight
Of the capacious heavens, a glimmering light
Of their vast bulk and their proportion,
Their distance and admir'd extension,
And never weigh'd how like an atome he
Sits on this spot of earth, he well might be
Lifted above the pitch of his low state,
And his big thoughts to something elevate.
But thou hast now check'd his aspiring heart,
By shewing him how despicable a part
He is of this vast Fabrick; and that done,
Conver'st his pride to adoration,

And

And from that glorious building dost erect
His humbled soul to the great Architect. (servi
Thou dost not coyn the heavens, making them
An avaritious minde : thou dost not swerve
From Truth to Fiction, nor advance the trade
Of such presumptuous spirits as have made
The Spheres their gain , and study heaven, to b.
Able to impose on the credulitie
Of easie souls, that would be thought to hold
Conference and counsel with the Stars; their bol.
Hearts daring so to tempt the mighty God,
And, 'cause not seen, slight his revenging Rod.
Thou aim'st at sound and solid Truth, that can
Endure the strictest test which any man
Can make, though Archimedes self revive,
And yet more skilful engines should contrive.

Thy Book's no swelling Volume, such as tires
With tedious method, the most sharp desires ;
But brief and comprehensive, making known
Not the Dispute, but the Conclusion.

In a small Frame, thou twice dost represent
To th' eye and ear the worlds vast continent ;
In this the full diameter we bear
Of the earths Globe, and ev'ry different Sphere,
Their compass, distance, bulk, and motion,
Each Planets true circumvolution.

But since the eye is the more certain sense,
And deep'st impression makes, thou dost dispense
To common sight, with dextrous Art, in small
Character, the epitome of this all;
The earth and heav'ns each in their station,
Their inter-space in due proportion,
In thy small Model, which the mean'st may see,
Thou dost present; which none has done but thee.
And all this too, nor so advance thine own
Or others fame or knowledge; but mak'st known
Th' Almighty's power, which in few days did

frame

This glorious Orb, that to this day the same
Order and course he first conferr'd, retains.
At thoughts whereof, how should our high-swoln'

veins

Fall flat, and all our proud designest' advance
Our selves (th' effect of sortish Ignorance)
Vanish like empty clouds, and be dispers'd
By th' wonders in thy Treatise are rehears'd!
Which makes this *Maxime* in all ages shine:
The best Philosopher proves the best Divine.

H. B

To



To the Ingenious AUTHOR
on his exact description of both
Globes, accompanied with
his divine Observations.

Divine Surveyor, whose successful skill
Measures both Globes with one directin
(quill,
Unleck'st each Mystery, till thou hast flown
From earths low footstool, to the heav'ns high
(throne,

And left a track behind, which doth display
Thy publike soul, in this directive way.

Sure more then wax did these thy Pisions trim
Which soar so like (if not) a Cherubim ;
They've Eagles, Dædalus, and all out-dene,
Thus hov'ring round the body of the Sun ;
Yet christen'd no seas with thy posthume name,
To purchase, by thy death, the alms of Fame :
Though you've baptiz'd the Arts, and made them
By joyning sacred hand's, Canonical,

(a
Ma

More lib'ral then before, now truely free,
Preferr'd to this Celestial Match by thee ;
That we must needs confess this Work of thine
Instals thee Mathematical Divine,
Whilst Doubts unriddled from thy Tripod, tell
Us, that each Answer is an Oracle.

It's to no boor to invoke the Nine,
Once thaw'd by these inspiring flames of thine.
What's here return'd, was yours at first, whilst
(Like rivers) pay our tribute to the sea : (we
And if that salt is lost it bad before,
You that gave that, can season it with more.)

Yet if the Reader chance to question why
These two obsequious friends are rank'd so nigh,
Th' answer's natural : We onely come
To fill what's waste, not to increase the sum.
Thus Cypher's plac'd before their digits, be
To make the Columns strait, not multiply.

Robert Bladwel,

Philomedicus.

To



To his worthy friend the ingeniou
Author of this Terrestrial and Cele-
stial SPHEROMETRY.

THe Globe of th' earth & sea in one conjoyn
Be'ng in regard of heav'n but as a point
And heav'n compared to that infinit
Greatness of God, be'ng as a point to it :
That you, with whom this little speck contains
Millions of greater bulk, should in your brain
Have lodg'd the imag'ry of those so vast
Dimensions ; sure was but to make us cast
Our eyes on the immense Divinity ;
Whose image that you are, we hereby see.

Tho. Urquhart



ERRATA.

Page 74. in the Table of the magnitude of the
Stars, for 88 read 18 ; and for 22 read 7.



The Mystery of
ASTRONOMY
Made plain
To the meanest Capacity.

Chap. I.

of the Subject-matter and Utility of
this Discourse.

Ques. What is the Subject of this
Discourse?

Ans. The Subject of this
Discourse is the whole
Univerſe.

Qu. What is that?

A. It is the most wonderful Frame
the whole world,* both the heavens * Gen. i. 1,
and the earth, created by God ; and

C. which

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which comprehends all his other creatures, there being nothing visible without the limits thereof : so that whatsoever is betwixt the Seat of the ALMIGHTY, and the Centre of the Earth, is the proper Subject of this Discourse.

Qu. *Why is this Work intituled, An Arithmetical description? &c.*

A. Because the form, greatness, and distances of the heavens and heavenly bodies, as they are in being one above another, even to the eighth Sphere, are made clear to the understanding, by the most exact, demonstrative, and infallible Rule of Arithmetical Progression, as the figures in my Spheres are proportionable, and made visible to the eye.

Qu. *What may profitably be learned by such a description?*

A. 1. God's immense Greatness, ^{* 2 Chron.} and incomprehensible Majestie, ^{*} whom the heaven of heavens cannot contain.

^{* Job 37.23} 2. His infinite ^{*} Power, in being the sole Author of such vast and glorious creatures.

^{* Psal 136. 5,7,8,9.} 3. His infinite ^{*} Wisdom, in ordering the several and various motions of the heavens and heavenly bodies ; as, the Sun, Moon, Stars, and Planets, in ² that

made plain to the meanest capacity.

3

that distance they are found to be.

4. His infinite * Goodness, in dispensing them so, as makes most for his own glory, the benefit of mankinde and of the world. The serious consideration whereof, * will even astonish the proud thoughts of men, work in them a sight of their own weaknes, and indeed * nothingnes, and consequently * Humility the grace of graces, and an awful dread and fear of God, * which is the beginning of wisdom.

*Exo.34.6.

*Job 37.1.

Jer.3.22.

* Isa.40.17

* Prov. 15.

33.

*chap.9.10

Qu. *Why doth Arithmetick perform this work better then Astronomy alone?*

A. In many respects. For although Astronomy be an excellent Science, and doth give much certainty to the skilful professors thereof; yet to such as are not skilful, the knowledge it contributes is hardly discernable, begetting but confused notions in most mens understandings: whereas by this Arithmetical description,

1. Astronomers themselves may be strengthened with a greater and more exact certainty.

2. The learned in any other Science may (as it were) with a glance of their eye upon the Figures, (which could not be reduced into this small Volume, by

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reason of their vast distances ; but are in true proportion and distance to be seen at Lambeth-marsh , at the house intended for the Lord Bacon's Colledge and with a touch of the Pen, and help of the Compals, make a true solution in an instant, of any, even the hardest questions in this work of Astronomy.

3. The conscientious and painful Divine, when he would draw argument from the heavens and heavenly bodie to perswade men to the worship of the great and wise God, he may by this Arithmetical way of description be furnished with plain and visible demonstrations exactly calculated.

4. Any ingenious person desirous of satisfaction in things of so great concernment, may in this way soon arriv to a competencie of knowledge, without passing through the long studie of Astronomy ; this of Arithmetick being more obvious to every capacity.

Qu. *What considerations doth the terrestrial Globe afford necessary for the understanding of the celestial?*

A. Very many : as first, in the Figure appeareth, the smalnes of its proportion in comparison of the heaven notwithstanding its dimensions and substance.

stance is known to be so great and large as it is, Instructs wonderfully to the knowledge of the vastness of the heaven and heavenly bodies.

Secondly, from the largeness and certainty of its dimensions, Arithmetick takes its footing, as upon a sure basis, to ground all its after-conclusions, which cannot fail in their certainties.

Qu. *What other considerations upon the earthly Globe are necessary, before one passeth to the contemplation of the heavenly bodies?*

A. Truely very many: * it being the * 1 Chron. place of our abode, until it please God 29.15. to call us to himself: and it were not wisdom to be ignorant of any of the works of God which are so neer us, but rather in the first place to be thorowly knowing in all things here belowe, that so we may come by due gradations, as by the Rule of Progression, to know the things above.

Chap. II.
Of the world's Creation and Continu-
ation.

Qu. **H**ow long hath the world been in being?

A. The Scriptures are our truest light to resolve all questions of this nature, (all other Histories being uncertain therein;) and upon the account thereof, exactly taken by Arithmetick, the world hath continued in being 5593 yeers, reckoning to this yeer of our Lord Christ 1644, as by the Learned is generally computed.

Qu. What general observation ariseth from the being of the whole world, and its so long continuance?

A. That no sooner it was, but then was it in the measure, and proportion, and motion, wherein, * through the wonderful providence of God, it hath continued even the same to this day.

Qu. What was it upon the first day of the Creation?

A. A Chaos, which was a huge, im-
menie, and frameleis Mass *, or disor-
derly

made plain to the meanest capacity.

7

derly confused heap, * nothing but ob- * Ver. 3, 4.
scurity, and as a continual night, * before * 2 Cor. 4, 6
God drew the light out of it.

Qu. Where was then the earth?

A. It was hid in the unmeasurable depth of waters, upon which the * Spi- * Gen. 1, 2.
rit of God moved, before the light was created.

Qu. What became of those waters?

A. Upon the second day of the crea- * Gen. 1, 6.
tion, they were divided from those waters which made the Sea, and placed above the firmament of the Stars into the ninth heaven.

Qu. What became then of the remainder of those waters which were left upon the earth? For it seems that it was still covered with waters.

A. * Upon the third day of the crea- * Gen. 1.
tion, God gathered together those wa- 9, 10.
ters into one place, which is the Sea; and then the earth appeared.

Qu. What then succeeded?

A. Then the Sea and the Earth together made this Globe, * which is the * Isa. 45, 18.
habitation of all mankind.

Qu. Is not the earth compassed about with the Sea?

A. Yea, and it hath left in it many places uncovered; so that the deep and

hollow places of the Glebe of the
 earth are replenished with the Sea,
 which makes it so round as it is.

Chap. III.*Of the Sea, its ebbing and flowing.*

Qu. **W**hat is the Sea?

A. * It is the great treasure of waters, wherein are several multitudes of fishes, and * from whence the Divine providence draws an infinite number of Rivers and Streams which run upon the face of the earth crossing the Springs thereof.

Qu. *Those rivers that are drawn from the Sea, do they not return thither again?*

A. * Yea, the Sea is the receptacle of them all, and is likewise the storehouse of waters, not onely to furnish all parts of the earth, but also the proper subject from whence the Sun draws the moist vapours into the middle Region of the air, and doth there form divers Meteors, but especially the rain whereby the whole world as a garden becomes watered, refreshed, and made fruitful.

Qu. *I*

Qu. If the Sea be the store-house of waters to supply the earth, which the sun draws from thence into the air into clouds, and so watereth the same, (as you alledge) the which hath continued ever since Noah's flood to this present, and yet the Sea never a jot the emptier, though so many thousand yeers since; How comes this to pass, and from whence hath the Sea its supply?

A. The Answer to this, depends upon this consideration, That all things in the world are continued, not by new creations, or supplies *de novo*, as from some other place; but by successive mutations or alterations: so as that what is to day in one form, becomes to morrow in another, and next day in a third; inasmuch as what is now water in the Sea, by the Suns attraction rises in a vapour, then thickens in the Middle Region, so falls upon the earth: and besides, what is retained for mutation of Minerals, Vegetables, and Animals, is perculated or strained thorow the spungie body of the earth, and flows thorow its numerous caverns into the Sea again; by reason whereof, there is a continual supply for generation, without any other then a present, and that

insensible deprivation of the Seas fulness.

Qu. *What is the cause of the flowing and ebbing of the Sea?*

A. The flowing and ebbing of the Sea, is sometimes slowe and gentle, and sometimes swift and violent, according

* *Plat. de Cœlo. 19.* to the nature and quality of the Moon,

which is to be distinguished by the several seasons of the year: and God hath so appointed it, for the purging, cleaning, and preserving of the same. For the Sea is a nurie of ill vapours, and would otherwise be a sink of stinking stuff; which are scummed and cleansed by the Tyde and Windes.

Qu. *The usual flowing and ebbing of the Sea appears twice a day in these parts of the world; but in some other parts there are many Tydes in a natural day. And whereas in some places the Sea usually flows gently up the Rivers, yet it happens in some other places the Tyde flows in a violent manner, and is high-tyde in a little time after. What is the reason thereof?*

A. To give exact reasons of the various ebbs and flows of the Sea, where they keep order in their circuits, and where not, would require a Discourse, and that a large one, by it self; a matter which

which the limits of this Treatise will not admit of. But in short, thus: Experience makes it good, that the ebbs and flows depend upon the motions and positions of the Planets, especially of the Sun and Moon. That it is so *de facto*, is evident,

1. Because the Tydes rise, as the Moon ascends the Meridian; and decline, as she descends from that height, and that in both Horizons.

2. Because the ebbs and flows keep not daily the same hour, but vary according to her mutations.

3. The Tydes are equal, where the days and the nights are equally divided under the Equinoctal, and nowhere else.

4. It appears from the difference of Tydes according to the different changes of the Moon. At her first change, the Tydes are small, to the first quarter; and so increase, as she grows bigger; decreasing as she wanes.

5. To this may be added, that in the main Ocean the Tydes swell and overspread more than in smaller Seas, Arms, or Crooks; because there she feeleth more effectually the force of the Planet being at liberty, then when she is pent

up into narrow bounds, which is the caule of the different ebbes and flows in several places in the main Sea, and in lakes and little rivers. And this shall suffice to have spoken of this matter.

Qu. *When doth the Sea purge most of all?*

A. When the Moon is at the Change or Full: for then the Sea purges, as the waters of a great Cauldron or Kettle over the fire. When it riseth up to the top, it casteth out the scum, until there be none left in: and to this purpose serve the ordinary and extraordinary Windes, which are (as it were) the spoons and scummers of the Creator, to purge and cleanse more and more the Sea, that great Cauldron of waters, which are so many ways serviceable, both to the earth, and to those that live therein.

Qu. *What may the depth of the Sea be?*

A. The Sea in some places is above an hundred fathom deep, and in other some places there is no bottom to be found, as some by experience have discovered, by letting down a Line with a Weight at the end thereof, many hundred fathoms in length, yet still there

was

was more Line required; and when supplied, yet no bottom found: and yet the Sea in no place is bottomless.

Qu. *How comes this to pass?*

A. Of this there can be but two reasons given:

1. Either Line was wanting, so that although it hath been tried with a Line of a vast length, yet it hath wanted of that exceeding deep profundity so immense a body is capable of: Or else,

2. Because of some Torrents of water *in profundo maris*, in the depth of the Sea, the Line and Plummet, which then cannot be of any great weight, is carried away by the rapid motion of the waters, and become thereby incapable of sounding the bottom.

Qu. *What observation ariseth from this Discourse of the Sea?*

A. The principal thing considerable herein, is * the power of the Creator, which all men ought to magnifie and ^{*Psal. 107.} admire. ^{24, 25, 26.}

Chap IV.

Of the Terrestrial Globe, our Antipodes, and whether the Earth move or not.

Qu. **W**Hat is the diameter of the Terrestrial Globe?

A. 6 thousand 782 miles ..

Qu. *What is then the circumference thereof?*

A. 21 thousand 600 miles : the whole consisting of 360 degrees, at 60 miles to a degree.

Qu. *In what time may a man (having no lett) go round about the same, after 16 miles a day?*

A. In 3 years, nine months, and 3 days, he may compass the same.

Qu. *Where is the Terrestrial Globe placed?*

A. It is placed in the middle of the Axletree of the world, and makes the Centre (that is to say, the prick, or point) of the world, or of the heavens, which turn about it, and are the Circumference thereof.

Qu. *How is this ponderous Globe supported?*

A. *It

A. It hangs in the air upon nothing, between the heavens, and is upheld by the onely will and almighty power of its Creator. Job 26. 7.

Qu. That thing or substance (which is called the earth) that hangs, we suppose hath something to hang upon; but it seems the earth is said to hang upon nothing: how is this naturally to be understood?

A. It hangs by the providence of God upon its own weight, and is as a very Point to the immense Circumference of the heavens, which equally on all parts thereof is a like distance from the earth.

The difficulty in understanding thereof, is that incomprehensible mystery of the Centre, which hath its foundation within it self; all parts of the Circumference inclining with a natural tendencie to the middle point, which is called the Centre. In a Spherical body, it would be very improper for any part of the Circumference to be the Basis or foundation to the rest; and therefore it was requisite it should have such a Basis as to which all Points in the Circumference should be alike inclined, and from which they should be equidistant, and that is that which is the Centre.

Qu.

Qu. Our Antipodes, whose feet are opposite to ours, seem to us to walk with their heads downward, as we in like manner seem so to them ; and yet all the inhabitants of the earth walk thereon alike, as if the earth to our seeming were flat like a trencher, and not round like a ball. What natural reason may be given, for the satisfaction of our mindes of this wonderful work of God ?

A. The whole Earth and Sea make together a perfect round Globous figure, (as aforesaid) and is encompassed by the heavens ; so that let a man be on what part of the surface thereof he will, yet the heavens are above him.

Those that are opposite to us, and therefore properly called Antipodal to us, are not under us, but against us, above and belowe ; being in this Spherical body to be understood, not of different Points of the Circumference one to another, but of any of them to the Centre : and therefore it is, that in all parts of the earth, creatures are said to be above it, or upon it.

That the earth and water make one Globous body, is evident by the Eclipse of the Moon. For every body gives a shadow like unto its own form : since there-

therefore the shadow in the Eclipse is round, the body that makes it must needs be so.

Qu. Doth the earth at any time move?

A. * No; it abides firm and stable, * Psal. 93.1
for the good and for the support of the and 104.5.
inhabitants thereof.

Qu. Some are of opinion that the earth
moveth; which is contrary to that which
in several places of the Scripture is affirm-
ed: What are the most pregnant reasons
to prove the contrary?

A. The earth, as to it self, in the
whole frame thereof, is immovable in
its locality; and this may be proved by
many demonstrations and reasons: but
one shall serve for all.

It must either first move in a direct
or right motion, up or down, or side-
ways: or secondly, in a circular mo-
tion, from the East to the West, from
the North to South; or on the con-
trary: or thirdly, from these motions
it must have a mixt motion.

These are the 3 motions local which
are acknowledged by the Ancients and
soundest Philosophers to be all the
kinds of regular motion. Other mo-
tions there are not, that are regular.

Now of those that affirm that the

D earth

earth moves, there are none who say the earth moves in a direct line, or in mixt motion; but onely in that motion which is circular.

But that it doth not move in a circular motion, I thus prove.

If there be a circular motion of the earth, the motion must be 360 degrees which is

$$\left. \begin{array}{l} 21600 \\ 900 \\ 15 \end{array} \right\} \text{miles} \left. \begin{array}{l} \text{in 24 hours.} \\ \text{in one hour.} \\ \text{in a minute of a} \\ \text{(hour.)} \end{array} \right\}$$

Now suppose a man shootheſt an Arrow upright in the air, it muſt have ſome time to fall down again to the earth: in the mean while, the man moves with the earth, (if the earth move at all; ſo that the Arrow muſt needs fall ſome diſtance from the man: if it be but half a minute of an hour, the Arrow will be 7 miles diſtant from the man. Then which, nothing is more contrary to every mans experience.

It is therefore very absurd to conceive any such motion of the earth. For what Artifice humane can be made to move in any motion 15 miles in a minute of time ? And if the motion of that Artifice should be the Arrow shot

out of the strongest bowe, or bullet out of a Piece, and be shot perpendicular, and imagine it to go 15 miles in a minute upright, (which it is impossible to do) yet in the descent it would be longer in time coming down, moving then onely by its own weight, and not the impulsion of the Engine or Artifice: in the mean time, the earth must be supposed not to have moved any jot in any maner of wise, much lets 15 miles from the centre of the Arrow or Bullet, or else the party that shot it must be so far off from the Arrow, he being upon the earth, and (if it moves) necessarily carried away by its rapid motion. A matter wholly contrary to Senie.

Many other reasons might be alleadged, to prove that the earth is immovable: but this being demonstrative, will I suppose satisfie.

Qu. What is further to be considered of the earth?

A. * It is the Lords footstool, which * *Ipsal.66.1.*
For he hath given to the children of men: * *Ipsal.115.*
wherefore although it be but a little ^{16.}
spot in comparison of the heavens, yet
is it the onely true Spouse of the firmament of heaven, which yeelds an infinite increase of good things, by reason

of the participation they have together. And notwithstanding the vast distance betwixt the heavens and the earth, yet is there such a sympathy & mutual love between them, as serves for the good of man, and the glory of the Creator.

- * Isa.44.23 * It is the lowest of all the elements,
- * Prov.27 black and * ponderous, invironed and
- 3. inclosed with the other three elements,
viz. Water, Air, Fire.
- * Gen.1.12 She is called the mother of * fruits,
- * Chap.2.5 * the productreis of all plants, * the
- * Eccles 5.9 nourisher of all living creatures, the
- * Ezek.26. foundation of all * buildings, * the se-
- 12. pulchre of the dead, the Centre of the
- * Joh.5.28 beautiful frame of the celestial Globe,
- * Gen.3.19 * the matter and substance of mans bo-
- * Job 38. dy, the receptacle of * heavenly in-
- 31,32,33. fluences.
- * Matth.6. * She is garnished with fragrant flow-
- ers, &c. and of man, beast, and fowl, inhabitated.

She is likewise comfortably quickened by the nourishing beams of the Sun, Moon, Planets, and fixed Stars, to the general comfort & contentment of all.

- * Deut.5.8 Qu. *It is said that* * the waters are be-
- * Psa.24.2 *neath the earth,* * that God hath founded it
- * Psa.136.6 *upon the sea,* * that the earth is above the
waters. *How then can you make good*
that

that the earth is the lowest of all the elements?

A. When the waters are said to be beneath the earth, as in the several places cited, it is not to be understood of the whole earth, but of some part thereof, belowe which there are waters; as we see, in the digging deep into the earth, there will appear a forcible emanation of waters. The Sea also is belowe his banks or bounds; but yet not so, but that both the Springs and the Sea have the stablishment of earth beneath them: for the one may be drawn dry, or at least, its supply is not from a continued profundity of waters, but from a soaking thorow the spungie body of the earth out of the Sea. The Sea also, we know, may be fathomed.

Allowing therefore that there are waters under some part of the earth, it notwithstanding remains true, that the lowermost, or rather, the innermost of this Globous part of the body, must be earth, as being the most solid and stable, and so more agreeable to the nature of a foundation.

Besides, we finde in the work of the Creation, that the earth appeared not until the waters were gathered: and

the gathering of the waters implies not a putting them under the earth, but a disposing of them together in some part of the earth.

Adde to this an Argument taken from the diameter of the earth, which is allowed to be above 67 hundred miles. And though the Sea, as to its surface or superficies, is as much in space or place as the surface of the earth, yet, as to its depth, it bears no comparison; the Sea being in very few places (as is before alleadged) above 100 fathom, which is not $\frac{1}{2}$ part of a mile, which holds, I say, no proportion with 67 hundred miles: Therefore, as to profundity, the waters must yeeld to the earth.

In all which, appears Gods wonderful power and wisdom, in placing and ordering this earthly Globe, (the Centre of the heavens) in such a strange and excellent maner, as discovers the goodness and providence of the Creator of it, in his continual preservation thereof in its variety of his blessings, as i. before specified.

Qu. If the footstool of the Lord here belowe, yeeld such an increase of good things, to the comfort, contentment, and delight

delight of the inhabitants thereof; What may we think of his Throne above! what pleasures are there reserved for those that love and delight in him!

A. The pleasures and delights of this world (comparatively to those that are above) * are but very few, of small durance, and very uncertain. * The joys above are infinite, and eternal, which every faithful soul shall have full assurance of; as by the ensuing discourse (in its due place) appeareth.

Chap. V.

Of the three Regions, their nature: of Meteors and Apparitions.

What is the next thing in this description, we are to consider of?

A. That space which is between the earth and the first heaven, or Circle of the Moon. All which space, to the superficial part of the Globe of the earth, and of the sea, is divided into three Stages or Regions, *viz.*

1. That next the earth, is called The lower Region.

2. That next to that, The middle Region.

3. The other above that, The higher Region.

In every one of which are formed other Mates of the quality of the Regions where they are formed.

Qu. What is the nature of the lower Region?

A. That Region being neer the earth, is sometimes hot, and sometimes cold. For there the Summer and Winter is felt and known to be, according to the course of the Sun, as it approacheth nearer to our Zenith or Vertical point, or goeth back from it.

Qu. How comes this Region to be hot?

A. By the reflex of the Sun, whose beams first striking the earth, do rebound back again to that Region, especially when his beams in the Summer-time are perpendicular, or the nearer they incline thereunto, and in the Meridional or Southern Climates.

Qu. How comes this Region to be cold?

A. In Winter, in the Northern parts it is very cold, because the Sun doth cast his beams obliquely, or sideways.

Note also, that it changeth in divers

vers places according to the seasons, or according to the reflexion of the Sun-beams.

Qu. *What is bred in this Region?*

A. The *Clouds, Dews, Rain, *the *Job 36.
Rain-bowe, and such-like. 28.

Qu. *What is the nature of the middle *Gen.9.13
Region?*

A. It is cold. For the air being naturally hot and moist, this humidity is evermore forced back by the cold exhalations which are drawn up from the earth, especially when the Sun-beam^s, being so far off, cannot warm the earth. So that this Region is the receptacle of Cold, which is there strengthened, by reason of the cohabitation and compression, or encounter between the other two Regions, which are contrary to that. For the higher Region is always hot, and so (in Summer) is the lower Region in like maner: by reason whereof, when the cold exhalations are drawn up into this middle Region, and there shut up, and restrained perforce by the contrary qualities which incloseth them, they must of necessity be cold, being so restrained and inclosed round about, they can neither go backward nor forward.

Qu. *What*

Qu. *What is engendered in this Region?*

*Psa. 148.8 A. * Storms, Tempelts, * Thunder,
 *Job 38.25 * Snow, Hail, Frost, and Darknes. And
 *Psal. 147. 16. in some parts of it, there is a place
 * Eph. 2.2. and 6.2. where * the Prince of the air, and other
 evil spirits, have their residence at cer-
 tain times, where they do terrible
 things in a fearful maner, when it
 pleaseth God to let loose the bridle
 unto them.

Qu. *What is the high and upper Region
 of the air?*

A. This Region is next unto the
 Celestial Circles, and is called by the
 name of *Fire*: not that there is fire in
 that Region, but in regard of the conti-
 nual motion, and by the beams of so
 many celestial bodies, the air is heated,
 and comes so neer unto the quality and
 nature of the *Fire*, as hath obtained
 that denomination.

Qu. *What then is the elemental fire?*

A. It is nothing but an air most pure,
 most subtil and thin; which is made
 hot by the motion of the celestial fires,
 which are so neer unto it.

Qu. *What is bred in this Region?*

A. * Lightnings, Fire-drakes, Co-
 metes, Blazing Stars, and such-like.

Qu. *What may the distance of these
 three*

three Regions be from the earth?

A. To know exactly their distance from the earth, or from one another, is not to be attempted, because those distances are not always the same, but different in several seasons, and devised only for better understanding, and distinguishing those things that are peculiar to each Region.

The upper Region is above the top of the highest mountain, and contains all that space to the element of Fire. This is always clear and serene, void of Clouds, Rain, Thunder, &c.

The other two belowe this, are not always of an equal magnitude. For the lower, whose termination is the utmost extent of the reflexion of the Sun, is greater in Summer, because then the reflexion from the earth is stronger and higher, and consequently the middle Region is then lesser. On the other hand, in Winter the lower Region is smaller, & the middle Region larger, because then the reflexion from the earth is weaker and lower.

Again, the middle Region, in respect of the other two, is less hot, called therefore commonly *The cold Region*, because the heat from above does not

so strongly penetrate thither, neither yet is it warm'd by reflexion from below, as is before declared.

Qu. *The Meteors that are formed in these three Regions, how are they divided?*

A. They are divided after three manner of ways: *viz.*

1. Into bodies perfectly and imperfectly mixt.

2. Into moist impressions, and dry.

3. Into Firy, Airy, Watery, and Earthy.

Q. *What is the matter and substance whereof the most part of the Meteors consist?*

A. It is either

1. Water, out of which proceed vapours: or

2. Earth, out of which come exhalations.

Qu. *What are engendered by those vapours?*

A. Those vapours being drawn up from the waters, and watery places, by the heat of the Sun, into the middle Region of the air, and there, after divers meetings with coldness, many

*Job 36.27 kindes of Meteors are engendered; as

*Psal.147. Clouds, Rain, *Snow, Hail, &c.

16.

Qu. B.

Qu. By way of digression, let me ask you what distance the clouds are from the earth?

A. There are some clouds distant from us less then a quarter of a mile, some half a mile, some 3 miles, some 9 miles; and some again sometimes 10, 20, 30, 40 miles; and the highest clouds of all are 50 miles above the earth.

Qu. What is the difference between those clouds that are neerest, and those that are farthest off from the earth?

A. That clouds are some higher then others, is a matter clear to sense: yea, it hath been seen, that clouds above one another have moved several ways. The clouds are different, according to the diversity of the matter of which they are made, and the power of the Sun in attraction according to several seasons.

There are tops of mountains that are above clouds, as hath been witnessed by such as having been upon them, have found the air clear and serene, without winde, when belowe it hath been cloudy, rainy, and turbulent.

Qu. What impressions proceed from the exhalations?

A. Ex-

A. Exhalations being thinner and lighter then vapours, pass the lowest and middle Regions of the air, and are carried up even to the highest Region, where, by reason of the excessive heat of the fire, they are kindled, and cause many kindes of shapes and impressions.

They are also sometimes clammy; by reason whereof, they cleaving together and not being dispersed, are after divers sorts set on fire, and appear sometime like Dragons, Goats, Candles, Spears, &c.

Chap. VI.
of the Elemental part of the world.

Qu. **W**HAT is the elemental part of the world?

A. It contains the four elements, *viz.*

1. The *Earth*, Both which make one
2. The *Water*, entire spherical body.
3. The *Air*, which environeth the Earth and the Water, (which is divided into the three Regions before specified;) which Air filleth all places upon a sud-

a sudden ; so that in the matter of things, there is nothing empty.

4. The *Fire*, which is placed next to the Sphere of the *Moon*, under the which it is turned about.

Qu. *What are those Elements ?*

A. They are of themselves pure substances , and the first and next beginnings , whereof all mixt bodies are compounded , and therefore not to be seen with our outward eyes. For as we our selves are bodies ; so without our outward sensies we can discern nothing but that which is compounded : and therefore the *Fire*, *Air*, *Water*, and *Earth*, which we daily feel or see , are not the Elements themselves, but things compounded of them.

Qu. *You say the four Elements are Earth, Water, Air, and Fire, which we may see and feel ; and yet you affirm that those Elements are compounded of the Elements which we see not. How is this to be understood ?*

A. The Elements with us are not pure, however they appear to be so ; but each of them hath some mixture the more or less of the other : and that appears , because from any of them extraction and separation may be made ; which

which elementary bodies, purely such, and void of all mixture, are not capable of.

Qu. *What is further to be considered of these four elements?*

A. Their agreement and disagreement the one with the other: which conjunctive contrariety, causeth divers and marvelous works in Nature, and is (by reason of their proper and fit mixtures) agreeable to their several natures and qualities.

Qu. *Why are there but just four elements?*

A. There are just so many as there are combinations and mixture of the simple and first qualities; which can be but four.

Qu. *How are they distinguished?*

A. Thus: *viz.*

1. The *Earth* is cold and dry.
2. The *Water* is moist and cold.
3. The *Air* is hot and moist.
4. The *Fire* is hot and dry.

In all which, God's singular providence shines, who by his wisdom hath ordered, and (as it were) wrapped and bound up the elements together, having placed the Earth in the Centre, the Waters round about, then the Air

and then the Fire ; which fire is not simply above them, but (as it were) infused among the other three: which distinction of the Elements, hinders not at all their fit and proper mixtures in the composition of all things that are under the cope of heaven.

Qu. What effects do naturally arise from the aforesaid impressions? &c.

A. 1. They occasion manifold profits to Gods creatures. * Ecc. 5. 9.
2. * They make the earth fruitful. * Jam. 5. 7.
3. * They purge and cleanse the air. * Job 37. 21, 22.
4. * They set forth Gods power, * Psa. 29. 4
5. * They threaten his vengeance. * Exo. 9. 25
6. * They punish the world. * Psal. 18. 13, 14.
7. * They move to repentance. * Jonah 1. 9, 16.

Q. What then is the universal, chief, and last end of these and all other things (we have hitherto discoursed of) in that place between the earth and the first heaven?

A. Gods singular providence over all his works here belowe, * which provide all referred to one end of his eternal glory. * Isa. 42. 12.

Chap. VII.

Of the Planets in general.

Qu. **I** Shall now desire to know, first, what may be observed concerning the Planets in general?

A. The celestial bodies are divided into two bands or parts: the one are fixed stars; the other are called Planets, (that is to say) Straglers, or Wanderers; & those are in number seven, to wit, the Moon, Mercury, Venus, the Sun, Mars, Jupiter, & Saturn. Which Planets are contained within that great and large space which is between the eighth heaven of the fixed stars, and the earth; and have each Planet its circle or heaven: for otherwise they should continually keep the same place, as the fixed Stars do.

Qu. What motion have these Planets?

A. They have their several motions, distinguishing the one from the other, as thus: The Moon hath her course apart, which she finisheth in a month; **M**ercury, **V**enus, and the **S**un, in a year; **M**ars, in two years; **J**upiter, in twelve years, and **S**aturn in thirty years.

This

This daily continual motion of the Planets is carried about by the *Primum nobile*, or first Moveable ; and yet have their particular and several motions ; which are not at all contrary, considering they are made and turned upon divers Poles upon which the heavens move, being many degrees distant the one from the other.

Qu. How is this made clear to the understanding ?

A. By a proper Simile. Let us suppose a large Wheel which may be moved and turned about from east to west every 24 hours. Let several flies or other creeping creatures move contrariwise upon the same Wheel from west to east, some slower, some swifter, from one certain point or mark: and imagine that some one of them may be a month moving round, another or more of them a yeer, another two, another 12, and other 30 years, before they can attain to the point from whence they began their motion ; yet supposing the great wheel to move round every 24 hours ; in east to west, and the other creeping creatures continually move from west to east.

Qu. What form have these Planets ?

E 2 A. They

A. They are all (as the fixed stars are) orbicular, or perfectly round.

Qu. If it be true that the Planets and other celestial bodies be perfectly round as you alleidge, How comes it to passe that some Astronomers, by their Astronomicall lobes, Optick Glasses, and Mathematical Instruments, finde some of them oval, some like the half Moon, some forke, some pointed, some in a maner square, and such-like various shapes, which the eye (thorow those Instruments) do appear?

A. They so appear, from the diverse and sundry Aspects which the Sun cast upon them, he being the light of the world: yet the Stars, the Planets, as also the Sun it self, through vapours neare the Horizon, may appear elliptical, or of an oval figure, and other figures, and yet really is perfectly Globous, and exactly round, as being the compleated Figure; so also is the Moon, all the rest of the Stars: yea, and the earth and the Sea together make but one Globe, notwithstanding the high hills and deep valleys in the earth, and the ascending and descending of the Sea.

Qu. What time then do the Astronomers observe by their Instruments, to finde

made plain to the meanest capacity.

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out the true figure or sh.ipes of the celestial bodies?

A. They appear most globous and round, when the air is clearest, and they in greatest distance from the Sun; as is easily demonstrable in the Moon, when she opposeth the Sun, and is then commonly called The Full Moon, which is her true figure.

Chap. VIII.
Of the Moon.

Qu. Shall now in the second place de-
sire to know how the Planets are
particularly described. And first, what
Planet that is which is next above the
earth?

A. The Moon; which is the seventh
planet.

Qu. What form and light hath she?

A. Her form is round (as aforesaid)
and her light is borrowed from the
Sun. For as a Looking-glass well po-
lished, transports or casts the light of
the fire, or of the Sun against a wall
or plank; so doth the Moon receive
and retain the light of the Sun,

and in a fair and clear night causeth the light to reflect against the earth.

Qu. Is it not said in the first chapter of Gen. 1.14 Genelis, that * God made two great lights, the greater light to rule the day, and the lesser light to rule the night ? which two lights are the Sun and the Moon. Now although the Moon be the lesser light, yet it seems from hence that she is a perfect light in her self, though not seen when she is near the Sun, by reason of his far more glorious great lustre. How then can you maintain that the Moon borrows her light from the Sun ?

A. In answer to this, be pleased to consider, first, that the Scripture, although it speaks of two Lights, yet it does not express them both to be essentially and inherently so. Sufficient therefore it is that they are both Lights, though one of them be by reflexion from the other. That also which is so by reflexion, is really and truly light ; as water is truly and sensibly hot, when made so by the fire. And so much to the text of the Scripture.

But further to make it appear that the Moon has its light by reflexion from the Sun, take two arguments which will leave the matter true, even to sense.

The

made plain to the meanest capacity.

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The first is from the several Aspects of the Moon in her variations.

The second, from her Eclipses.

First, from the several Aspects of the Moon, it appears that her light is so borrowed, because she is enlightened only on that part of the Globe which has its aspect towards the Sun, or upon which the Sun has its aspect: so in the first quarter, the Sun being new set in the west, that part of the Moon is enlightened which is towards the west; and though it be the full half of her Globe, yet is there to us only a small part of her light visible, *viz.* that illuminated semi-circle, or her horns, as they are vulgarly called; which more and more increase, as they both grow into a direct opposition: and when they are diametrically opposite, then doth that half of her that is enlightened fully appear to us; which we call her being in the Full: from which time, (the Moon passing her circuit more slowly then the Sun) his reflexion upon her is from the east, the eastern side of her globe being then only enlightened.

And thus we see, that the light of the Moon is more or less to us-ward, according as her posture is towards the

Sun. The other parts of her that receive not the reflexion, being, if not dark, yet without any considerable illumination.

Which the second argument from the Eclipse doth somewhat more clearly prove, because it shews the Moon to be a dark body, when she is in such a line of opposition to the Sun, as that the earth (being an opacous or gross body) interposing, she cannot receive her reflexion from the Sun: which is yet further manifest, by the beginning and end of Eclipses, as she gradually loses and gains her light, until they both removing into a line of opposition, where there is no such interposure, she becomes again wholly enlightened.

Safely therefore may we conclude, that though they are both great and glorious lights, and that the Sun is so essentially; yet that the Moon is so only by mutation or reflexion from the Sun.

Qu. What else is to be considered of the Moon?

*Psal. 104. 12. A. First, her sweet temper which doth so qualifie the extreme heat of the Sun, that the elementa world is thereby preserved, and sub-sisteth;

sisteth : to which purpose , this Lunary body runs thorow the Zodiack thirteen times in a yeer, and doth commodiously move or meet in Signes or places of heaven fit and proper , in imitation of the Sun : so that in Winter she (as it were) chuseth the signes of the Summer, and in Summer the signes of the Winter, whereby the extremities of those qualities are moderated ; and casts back the sun-beams here below upon the earth, with an admirable temperature.

Secondly , in regard she changeth every month, she is called the true Kalender (in her Changes, Increase, Full, and Decrease) of Festival days.

Thirdly , * she is ordained to be the Gen.1.16
Psal.136. mistrels and governess of the night.

Fourthly , she is surnamed the Princesses of the Sea ; upon the ebbing and flowing whereof, she hath a marvelous power: for if she decline, or be in the first quarter, then the Tyde is weak; but when she changes, or is at the full, then is the Tyde violent & strong: upon which occasion it is, that this Planet (which rules over the humidity and moisture) causeth the mass or heap of waters in the Sea to swell and increase, and carries them to and fro , according as she is her self in

in the east, or as she bends downward in the west.

Fifthly, she hath a marvelous power over all kinde of Animals and living creatures.

Qu. *What is the cause of the Eclipse of the Moon?*

The Eclipse of the Moon is occasioned by the encounter of the shadow of the earth, which is in opposition between the Sun and the Moon when she is at the full ; and then the Sun and the Moon are right over against one another in two opposite points, which are called the Head and the Tayl of the Dragon, under the Ecliptick Line ; the earth being between both, darkneth and depriveth us of light, insomuch that we cannot see the Moon lightned with the Sun-beams. When the Moon is found in one of these two points, then she is wholly defective, and in the full Eclipse : and if she be neer to either of these two points, she is darkned more or less, according as she is neer unto us, or unto the Ecliptick Line.

Qu. *May the Eclipse of the Moon be universal?*

A. Yea, it may be universal ; and the

the reason is, because the earth is far bigger then the Moon, and thereby able to shadow her whole body, for that she will not suffer the Moon to receive any light from the Sun, from whom she always borroweth her light.

Qu. What is the distance of the Moon from the earth?

A. 160 thousand 426 miles.

Qu. How big is the Moon?

A. She is 40 times less then the earth.

Qu. What is her diameter, or thickness?

A. 1 thousand 828 miles.

Qu. What is the circumference of her circle or heaven?

A. 962 thousand 556 miles.

Qu. Very much and many things are hitherto affirmed touching the space between the earth and the heavens, and concerning the Planets, several Circles, and now of the exact distance of the Moon from the earth to be 160 thousand 426 miles; and so of her bigness, thickness, and circumference of her circle or heaven. But since mere affirmations, or the opinions of Authors, are not sufficient proofs, it will be of greatest satisfaction, and most useful throughout this Discourse and Description of

of the heavenly bodies, to express in this place briefly what are those grounds upon which the Astronomers do come to know that those Conclusions they draw are true, that so these Arithmetical Calculations may appear to be real truths, and not mere affirmations. Pray therefore what are those grounds?

A. The distance from the earth, the magnitude, thicknes, and circumference of the Moon, is Astronomically to be computed, and instrumentally observed: her Parallax is chiefly considered; her Perigeiety, Apogeiety, and Eccentricity; with many Astronomical Observations.

And if the distance, magnitude, circumference, &c. of her, the Sun, and the earth, were not known, or could not be found out, it were impossible to finde out the time, quantity, and continuance, &c. of the Eclipses either of her, or of the Sun.

But the time, quantity, continuance, &c. of Eclipses is certainly known.

Therefore, the distance, magnitude, circumference, &c. is likewise known.

Chap. IX.
Of Mercury.

Qu. **W**Hat Planet is next above the Moon?

A. *Mercury*; which is the fifth Planet.

Qu. *What is confiderable in this Planet?*

A. This Planet is but a little seen with us, by reason of the thick vapours and fogs with the which the air is overcast; which is a main obstacle, and hindereth much the line of our aim and level with the Horizon: and in regard of his stay and abode neer unto the Sun (whose great lustre and brightnes defaceth and putteth out as it were all other lights that approach neer unto it) it declines or falls from beyond the Ecliptick Line against the Meridional part toward which it doth ordinarily bend, leaving the Planet *Venus* always on the north-side.

This Planet continually waiteth upon the Sun, and followeth him as a servant

servant followeth his master, and is never above 28 degrees from him.

Qu. How far is this Planet above the Moon?

A. 356 thousand 102 miles.

Qu. What is then his distance from the earth?

A. 516 thousand 528 miles.

Qu. How big is this Planet?

A. 3 thousand 140 times less then the earth.

Qu. Then it seems it is the least of all the Planets, and of all other the celestial lights: what therefore may be the diameter of it?

A. As little as it is, yet of it self it is a great light, insomuch that if it were neer us, it would cover a greater continent of land then England is: for the diameter thereof is 430 miles.

Qu. What is the circumference of its heaven?

A. 3 millions 99 thousand 168 miles.

Chap. X.
Of Venus.

Qu. **W**HAT Planet is next above Mercury?

A. *Venus* ; which is the fifth Planet.

Qu. *What is observable in this Planet?*

A. This Planet, with *Mercury*, seem to be (as it were) Yeomen of the Guard to the Sun : for they are nothing neer so far distant, as the other Planets above him are ; but in comparison of the other Planets, they seem to be neer him ; especially this Planet *Venus*, which is one celestial signe and a half, and somewhat more ; and *Mercury* a little less then a signe : both which Planets turn continually about the Sun, and do accompany him in an orderly course.

But this Planet being left by *Mercury* on the North-side, is so great and bright, that we may discern the shadow of ones body in the beams thereof : for by her declining, she is remoed so far off from the Sun, that she

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cannot be obscured by the light thereof ; and yet notwithstanding, she doth so truely and faithfully accompany him, that oftentimes she riseth in the morning before him, and at other times she followeth him very close towards the evening : and the rest of the time she is hid from our sight, by being so neer the Sun.

Qu. *How is this Planet otherwise called ?*

A. She is called by some, The dainty effeminate Planet ; and by others, The Suns handmaid, because she doth so faithfully accompany him, (as aforesaid.)

Qu. *How far is this Planet above Mercury ?*

A. 315 thousand 298 miles.

Qu. *What is then her distance from the earth ?*

A. 821 thousand 826 miles.

Qu. *How big is this Planet ?*

A. 32 times les then the earth.

Qu. *What is her diameter ?*

A. 1 thousand 986 miles.

Qu. *What is the circumference of her heaven ?*

A. 4 millions 990 thousand 956 miles.

Chap. XI.
Of the Sun.

Qu. **W**HAT Planet is next above Venus?

A. The Sun ; which is the fourth Planet.

Qu. *What is observable concerning this Planet?*

A. This Planet is placed in the middle between the other six Planets, having Mars, Jupiter, and Saturn, above him ; and Venus, Mercury, and the Moon, under him. This glorious Planet is the * continual fountain of heat, the source or head of bright shining light, the life of the universe, the eye and torch of the world ; the ornament, grace, and beauty of the firmament ; the King of the fixed stars and Planets, the Prince of the Celestial fires, and hottest of all the heavenly bodies : the servant of God and of Nature, that gives life unto all the creatures, by a singular blessing and providence of the Creator.

Psal. 19.

5,6.

Qu. You alledge that the Sun is the

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fountain of heat, and that he is the hottest of all the heavenly bodies ; whereas others affirm there is no heat in the body of the Sun, and therefore is not the subject, but the efficient cause of heat. For, say they, the prime subject of heat is the element of Fire, the prime efficient cause is the Sun, which can produce heat, though he be not hot himself. And the reason they give, is, That if the Sun be the subject of heat, because he is the original and effector of it, then Saturn is the subject of cold, the Moon of moisture, and Mars of dryness, and so we shall place action and passion, and all the elementary qualities, in the heavens, making a Chaos and confusion of celestial and sublunary bodies. Again, in the Suns vicinity causeth the greatest heat, why are the tops of the highest mountain perpetually cold and snowie ? Whereupon they conclude, that the Sun is the cause of heat, though he be not hot ; as he is the cause of generation and corruption, though he be neither generable nor corruptible. What answer can you give to this ?

A. To this Question (being not Mathematical, but Philosophical) I shall give a twofold Answer.

First, as to Reasons Philosophical.

1. That the Sun, and not the element

of Fire is the original of heat. For if the element of Fire were, all parts of the earths superficies would be equally hot ; the element of Fire being equidistant from all parts of the surface of the earth : whereas we finde evidently the several parts of the earthly Globe to be differently hot or cold, according to the approximation or remoteness of the Suns body.

2. The giving life, growth, and augmentation, to all animals, vegetables, and minerals, is from the real imparting of actual heat from the Sun : and therefore in the absence or distance of the Sun in the Winter, its defect is supplied by the application of that which is actually hot ; to which end, in some Noble-men's Gardens in *Germany*, great fires are made, whereby their fruit-trees, *viz.* Peaches, Pomegranates, Lemons, and Figs, are forced in Winter, and produce fruit at the time of the yeer, pleasant to sight and taste ; as those of *Nerbon* in *France*. I say therefore, Since that which supplies its absence is actually and subiectively hot, it evinces clearly that the Sun is hot, and so appears when it is present or neer.

3. The cold and snow upon the tops of high mountains, is no more an argument agaist the heat of the Sun, then of the element of Fire : the cause whereof, is the coldnes of that Region of the air ; which is occasioned by its wanting the reflexion of the Sun's heat from the earth, which such parts of the air as are neer to the body of the earth do enjoy.

4. The Sun is no otherwise the cause of generation, then by the real imparting of such a degree and proportion of heat, as, according to the pre-disposition of several bodies, is requisite thereunto. Neither does it at all follow, that because it is not generable and corruptible, therefore it is not hot : it may be one, without the other : so that as it is not deemed to be the efficient cause of heat, hence I make account appears, that it is also the subject and original of heat. Which if it were not, I see not how it could be the efficient cause : for all things do beget heat, either by motion and attrition of another body, or by communication of heat from it self. Since therefore the Sun does it not the first way, it must do it the second way, and consequently

quently be in it self subjectively hot.

Secondly, for Scripture-Arguments, many might be urged; but one will be sufficient, from the 19 Psalm, where you see heat attributed to the Sun. And it is further observable, that in no part of the Scripture, the heat in sublunary bodies is referred to the element of Fire, but always to the Sun.

What is it that in great Drouths
burns up the Pasture-grounds, the trees,
and * corn, but the continual afflux of ^{*Mat. 13} the Suns heat, without the seasonable
interposition of rain or clouds? what
is more clear to our own experience?
So that we have as little reason to de-
ny its heat, giving credit to our sense
of Feeling, as we should have to deny
its light, believing our sense of See-
ing.

Qu. What other observation may be of the Sun?

A. This Planet doth properly rule and order the course of the four Seasons of the year, in that heaven where now it is.

Qu. What if it were higher or lower
than it is?

A. Then the seasons of the year would be out of order, and quite over-

thrown: wherefore observe, that the Sun, in his proper and in his regular courses, (occasioned by the motion of the first Moveable) doth (in the heaven where God placed him) temper and alay, by his heat, the extreme coldness of the skie, *Saturn*, and the Moon.

Now if the Sun were in the place of the Circle of the Moon, and the Moon above in the place or Circle of the Sun, the earth would be burned with the heat thereof: and if, on the contrary, the Sun were in the heaven of *Saturn*, he would be too far distant from the earth; which would wax cold by reason of the Moon, and too little heated by the Planets *Mercury*, *Venus*, *Mars*, and *Jupiter*; so that it would bring forth nothing.

Here is the wisdom of the Creator seen, in placing the Sun where it is, for the good of all superiour and inferiour bodies.

Qu. What do you mean, when you say that the Sun in his proper and in his irregular courses is so beneficial to the earth, &c. Is the course of the Sun at any time irregular, or not in a right rule? If it be so, how comes it to pass, that from day to day thorowout the whole yeer, he turning about

about the world, causeth the days and the nights so equally to appear unto us, answerable to the several seasons of the yeer?

A. The word *irregular* is not here to be taken in his proper and genuine sense. For the Suns motion is always properly regular; otherwise no certain science could be made of its Revolutions and Courses, in, to, and from the parallel Circles, nor its Eclipses, and the seasons of the year.

By *irregularity*, therefore, is understood its obliquity, for that it proceeds not in a line straitly circular, but oblique, according to the obliquity of the Zodiack.

When then the Sun is said to be in his irregular courses, thereby is meant its distance from the Ecliptick Line, and its approximation to the Tropicks; by means whereof, the Seasons of the year are varied, each part of the yeer having thereby a different proportion of heat from his body, the fountain and original thereof.

Q. How doth the Sun cause the day and the night to appear?

A. * He turns continually about our Hemisphere the one half of the day, and in like maner the other half he

turns about the other Hemisphere which is opposite to ours : but in his absence from us, whiles he remains there, the night comes upon us, by reason of the shadow of the earth.

Q. The shadow of the earth then it seems causeth darkness, which we call night; above or beyond which shadow, there can be no darkness, but a continual light round about the world. What therefore may be the extent of that shadow?

A. The extent of the shadow of the earth is 74 thousand 602 miles.

Q. How is this discerned?

A. It would be too tedious to shew the grounds of proceeding to the solution of every Question. But, that you may not doubt the grounds to be good and substantial, you shall have satisfaction to this your curiosity, by these Rules following.

1. Note that the distance of the Sun from the earth is 4169955 miles.

2. The diameter of the earth is 6782 miles.

3. The Suns distance I divide by the earths diameter, and finde the quotient to be 614. and so many times the diameter of the earth, reaches up to the Sun.

4. I proportion by the Compas the diameter of the earth, in a Figure the length of a Barley-corn, (or third part of an inch :) which being divided by 3, makes 204 inches ; and that being divided by 12, comes to 17 foot.

5. I chuse a Plain Level just of that length, *viz.* 17 foot ; upon which, at one end, I place the figure of the earth ; and at the other end thereof, I set a light in proportion to the Sun.

6. The same light being at that distance from the figure of the earth, makes the shadow thereof to be 11 times the length of the said diameter.

7. I multiply the said diameter, which is (as above) 6782 miles, by 11, and that produceth 74602 miles; which is the length of the said shadow, and may well cause so great a darknes as night it self is to our sight, notwithstanding the greatness and glorious light of the Sun.

Q. What is the daily circular course of the Sun ?

A. 25 millions 19 thousand 732 miles.

Qu. How many thousand miles then doth he run in a minute of an hour ?

A. Although we perceive him not

to budge, nor know any thing of his going, but when he is advanced in his course; yet in one minute of an hour he runs 17 thousand 381 miles $\frac{1}{4}$.

Qu. It seems then that the Sun is carried about the heavens and the earth, and accomplisheth his circular course, in 24 hours: What benefit ariseth thereby?

A. The Sun, by that sweet benefit, and agreeable revolutions of the day and the night, gives rest, ease, contentment, and delight to man, and all other living creatures.

Besides, it is the will of God that the Sun should carry the light round about the world every day, that thereby the excellent riches and beauty of his works may the better appear.

So that life and light are the two effects of the Sun, which rules the day, as the Moon doth the night.

Qu. What may be said of the Eclipse of the Sun?

A. Concerning the Eclipses, which word signifies a defect, or failing, because, that when the Eclipses happen, it seems unto us, that the Sun and the Moon are defective and failing: but that cannot be properly said of the Sun, in the same sense as it may be said of the Moon.

his For although the Moon meet in opposition, (the earth between both depriving us of the light of the Sun) yet that happens not thorowout all the climates of the Hemisphere, because the body of the Moon is too little to hide from us the body of the Sun in the said climates. Wherefore the Eclipse of the sun ought rather to be called a cloud-daying or obscuring skreen from us, rather then an Eclipse, or failing in it self. But then that of the Moon, by being sometimes at the Full, yet is such, as no climate for that space of many hours enjoys the light at all; upon which accidents follow divers changes and alterations in the world.

Qu. How far is this glorious Planet above Venus?

A. 3 millions 339 thousand 796 miles.

Qu. What is then his distance from the earth?

A. When he is in his Apogæa, that is, at the highest, his distance is 4 millions 329 thousand 244 miles. And when he is in his Perigæum, that is, at the lowest, he is then distant from us 4 millions and 14 thousand miles.

Qu. What

Qu. What is the difference between those two distances?

A. The difference (that is to say) between the Sun in Summer and Winter, is 315 thousand 244 miles. So that the Sun draws nearer unto us, or runs from us, according as the days lengthen or shorten, 836 miles ⁱⁿ every day throughout the year.

Qu. Is not the Sun of an equal distance from the earth in winter as in summer, as the other Planets are, notwithstanding their several motions?

A. Yea, it is the self-same distance in both seasons, as well when he is in the Winter as in the Summer-Solstice.

Qu. Why then do you make such a distinction, as if the Sun were so many hundred thousand miles nearer the earth in Summer than in Winter?

A. It is not meant of the whole earth, but of this or that part thereof, to which it is sometimes nearer, and sometimes further off: As suppose England, Spain, Germany; the difference of Seasons being reckoned with reference to several Countries; in some whereof, at one and the same time it is Winter, when in othersome it is Summer; according to its approach

approach to, or distance from the earth.

So that although the Sun is always equidistant from the earth, yet to this or that part, it hath at several Seasons its approaches.

Qu. *What then is the true distance of the Sun from the earth?*

A. 4 millions 169 thousand 955 miles $\frac{1}{2}$.

Qu. *How great is this Planet?*

A. It is 166 times bigger then the earth.

Qu. *What is the diameter thereof?*

A. 45 thousand 450 miles.

Qu. *What is the circumference of the circle or heaven of this Planet?*

A. 25 millions, &c. of miles (as is before expressed.)

Qu. *How many times greater is the Sun then the Moon?*

A. Although the Sun and the Moon (which are called the two great lights) appear of a like bigness unto us, yet is the Sun 6 thousand 640 times greater then the Moon.

Qu. *What may be observed by this description of the Sun?*

A. When we seriously consider what good all inferiour bodies receive thereby,

by, the greatness, swiftness, and distance of this Planet from us, his daily oblique course, his substance, form, Ecliptes, motions, and conjunctions of contrary motions ; we shall have just cause to adore and reverence the admirable wisdom and power of the Creator, in such an excellent and wonderful body as that of the Sun ; and not slightly pass over, as the maner is, but stand amazed thereat.

Chap. XII.

of Mars.

Qu. **W**HAT Planet is that which is next above the Sun ?

A. *Mars* ; which is the third Planet.

Qu. *Why is this Planet so named ?*

A. The word *Mars* signifies War ; also it signifies red, or enflamed ; and is so named, because he is next unto the Sun, and by its influence makes the sublunary bodies fierce and violent.

Qu. *How far is this Planet above the Sun ?*

A. 1 million 936 thousand 786 miles.

Qu. *What*

made plain to the meanest capacity.

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Qu. What is then his distance from the earth?

A. 6 millions 108 thousand 408 miles.

Qu. How great is this Planet?

A. Half as big again as the earth.

Qu. What is the diameter thereof?

A. 9 thousand 450 miles.

Qu. What is the circumference of its heaven?

A. 36 millions 650 thousand 448 miles.

Chap. XIII.

Of Jupiter.

Qu. What Planet is next above Mars?

A. Jupiter; which is the second Planet.

Qu. What is the meaning of the word?

A. The word Jupiter (in the Original) signifies quickning, or life-giving: the word also signifies, Gods assistance towards his creatures.

Qu. What is the influence of this Planet?

A. It is observed that the influence of

of this Planet is very temperate ; and that one while it warms the coldnes of the superiour Planet *Saturn*, and otherwhiles doth moderate the heat of the Planet next under it, which is *Mars*. It doth also graciously help and relieve the inferiour bodies.

The Heathen observing the sweet influence of this Planet, made it their great God.

Q. What is the nature of this Planet ?

A. It is hot and moist temperate.

Qu. How far is this Planet above Mars ?

A. 37 millions 891 thousand 591 miles.

Qu. What is then his distance from the earth ?

A. 44 millions of miles.

Qu. How great is this Planet ?

A. 91 times greater then the earth.

Q. What is the diameter thereof ?

A. 31 thousand 200 miles.

Q. What is the circumference of its heaven ?

A. 264 millions of miles.

Chap. XIV.
Of Saturn.

Qu. **W**Hat Planet is that next above Jupiter ?

A. *Saturn* ; the first Planet.

Qu. *What is to be observed concerning this highest Planet ?*

A. This celestial body is neerest unto the eighth heaven of the fixed Stars, and is exceeding cold, (partaking more thereof) because she is the neerest (of all the other Planets) unto the celestial waters, (which are above the firmament) where the heat of the fixed Stars is qualified by that exceeding great store of waters.

Qu. *How come the Astronomers to know that this Planet *Saturn* is cold, (as the Moon in like manner is) and the rest of the Planets hot ?*

A. It is confessedly known, that by the natural vertue and power of the Stars, heat and cold, and many other manifest and occult qualities are projected and bestowed upon the sublunary bodies. And it cannot be other-

wise proved by any firm and solid reason, why the Stars, which are light and bright bodies, and as it were candles enkindled in the world, and placed by God in heaven, by their periodical motion and diurnal revolution stirring up all things to production and generation, should not be said to be habitually hot: for all the stars are hot more or less, because they are all bright, clear, and light, more or less. And by how much the brighter they are, by so much the hotter they are.

Hence the Sun is most manifest in his heat, because most manifest in his claritude and brightness; which is to be understood onely of heavenly light, which by its nature shews its effects in calefaction, vivification, generation, production, &c. For the light that we see in Crystal or Ice, is not hot, neither doth it heat, because they have not in them the principles of calefaction. And so when *Saturn* is said to be cold, or the Moon cold, it is to be understood comparatively for less hot.

And so *Saturn* may be said to be hot, because he is clear; yet because he effecteth cold more then heat, therefore he is said to be cold. For all Ages and inodern

modern experience knoweth, that when *Saurn* is in conjunction or radiation with the Sun or Moon, the two great Lights, he diminisheth heat in the hot seasons of the year, and augmenteth cold in the colder times; therefore he is said to be cold. Besides his propinquity to the Starry heaven, great distance from the earth, and his intrinsical hidden qualities of cold operation, he prohibits the heat to descend.

And this sufficeth for answer to this question.

Q. What is the influence of this Planet?

A. It makes the body chili, melancholy, and dry.

Q. How far is this Planet above Jupiter?

A. 28 millions of miles.

Q. What is then his distance from the earth?

A. 72 millions of miles.

Qu. How great is this Planet?

A. 96 times greater then the earth.

Qu. If this Planet or wandering star be so many times greater then the earth, then how many times is it greater then that little star Mercury, the least of all the Planets?

A. Although these two Stars appear to us almost of equal bigness, yet is *Saurn* 301 thousand 728 times bigger

then *Mercury*; and the reason is, in regard of that exceeding distance it is above the same, which is 71 millions 483 thousand 472 miles.

Qu. *What is the diameter of this great Planet?*

A. 37 thousand 800 miles.

Qu. *What is the circumference of its heaven?*

A. 432 millions of miles.

Chap. XV.
Of the eighth or starry heaven.

Qu. *What heaven is that which is next above the heaven of the Planet Saturn?*

A. It is that heaven commonly called * *Gen. i. 6.* 'the firmament; which heaven embraceth and comprehends all the aforesaid heavens or circles of the seven Planets.

Qu. *Of what substance is this firmament of heaven?*

A. This great extent is not of a thin substance, as is the Water, the Air, or the Fire; nor of a gross and obscure substance, as the Earth: but * being of a substance without comparison finer and

and thinner then any under it, gives place to those bodies that are more solid. Whereupon some Philosophers have very well said, that the Firmament is not properly solid, thin, heavie, nor light, as the other bodies are.

Qu. *What are the principal Circles in the Celestial Globe, so much observed by Astronomers?*

These six: *viz.*

1. The *Æquator*, or *Æquinoctial*; which is a great Circle placed in the middle of the Sphere, between either or both Poles of the world; and divides both Poles by equal spaces the heavens, and crosses the Zodiack in two points, *viz. Aries and Libra*; which when the Sun comes to it, causes equal day and night thorowout the world, under the Poles excepted.

2. The *Zodiack*; which is so called, from the Greek word *Zoës*, which signifies life, because it is the path of the Sun, who is called the Author of life. It is a bowing Circle, and crosseth thwartly the *Æquinoctial* and first Mover, and appears bending in respect of the Poles of the world, and from them is unequally distant. It is one of the 6 principal and greatest Circles in the

Firmament, in which the 12 Signes are placed; having a circular Line in the midiu thereof, called *The E lippick Line*.

3. The two *Colures*, which are generally called *The Great Circles*, drawn by the Poles of the world; which take their names from the Greek word *Kolouro*, which signifies *unperfect*, for that they never are seen whole in the turning about of the world, as the other Circles are.

4. The *Meridian*; which is a great Circle that goeth by the Poles of the world, and the highth of any place.

5. The *Horizon*; which is a Circle that divideth the upper half Sphere of the Firmament from the lower half Sphere which we see not.

6. The two *Tropiques*; which are so calle ^l from the Greek word *Tropequoy*, which is as much as to say, *Turnings again*; for that when the Sun is digreſſed from the *Æquator*, and comes unto those points, he turns back again.

These two touch the Zodiack at the beginning of *Cancer* and *Capricorn*; *Cancer* being Northerly, and the Summer-Circle to those on this side the *Æquinoſial*; and *Capricorn* Southerly, and the Winter-Circle to us, but *contra* to those

made plain to the meanest capacity.

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those on the other side of the $\text{\AE}quinoxi$ al.

Qu. *Why is the Circle of the Zodiack oblique or overthwart, and not exactly or straitly circular, as that of the $\text{\AE}quinoxi$ al? &c.*

A. For the better distribution of the vivid heat of the Planets to several parts of the earth. For if they, especially the Sun, should have moved in a strait Circle without obliquity, but a small part of the earth would have enjoyed the comfort of their heat and influence; and that also in so high a degree, that it would have rendered even the part uncomfortable for habitation, as it is under the $\text{\AE}quinoxi$ al. What is now, by their oblique course, the communicate themselves in some proportion to the whole earth, begetting thereby the distinction of times, and the various seasons of the year, and the different temperature of several Regions and Countries.

Qu. *How broad is this Circle?*

A. The breadth of it is 12 degrees.

Qu. *How much is that?*

A. 1. Upon the earth, it is 720 miles.

2. In the Circle of the Moon, it is

32 thousand 85 miles ;

3. In the Circle of the Sun, it is 833 thousand 991 miles.

4. In the Circle of the Starry heaven, it is 23 millions 200 thousand miles.

Qu. *What are the 12 Signes in the Zodiack?*

A. They are a certain number of stars, representing 12 several forms or figures, some of humane shape, some of other creatures : but are so called, for distinction-sake ; as the number of stars representing a Ram, is called *Aries* ; those of a Bull, is called *Taurus* ; and so of the rest. Not that there are any such creatures in the Zodiack, or that they have any real resemblance, but that they are so called for distinction-sake, (as aforesaid.)

Qu. *What are the two Poles ?*

A. The two Poles, *viz.* the North and the South Poles, are the two ends or points of the Astronomical Axletree, upon which the heavens are imagined to be turned.

Qu. *What are we further to consider of this eighth heaven?*

* Gen. 1. 16, 17. Ch. 15. 5. Job 26. 13.

A. The glory and beauty thereof ; it being enriched, bedecked, and adorned

ed with millions of golden glistening spangles, which are the fixed Stars; which serve not onely for an ornament to the heavens, but likewise (although so high above the Planets) have their influence, virtue, and efficacie, whereby they alter and change the air, the seasons of the year, and inferiour bodies, in a wonderful, strange and secret manner.

Q. Are all these numberless number of Stars of use?

A. Certainly God made all the Celestial bodies, as the fixed Stars, and the Planets, so great, and such a number of lights, so hot, with such motions, that we cannot think that he made any one of them in vain, but all for his own pleasure, and for the benefit and good of the earth, the sea, and all things therein contained.

Q. One star differeth from another in glory and in greatness. What may be observed concerning the same?

A. Astronomers have taken special notice of the number of 1025 of the principal apparent noted Stars of all the rest: of which number they observe as followeth, viz.

1. Of the least sort , 55	88	
2. Of the next greatness, 221	36	
3. Of the third greatness, 280	54	times bigger
4. Of the fourth greatness, 208	22	then the earth.
5. Of the fifth greatness, 46	87	
6. Of the grea- test of all, 15	107	

Note also, that some other of the ordinary stars are much bigger then the whole compass of the earth ; some again are much less then the earth : but the least of all the stars in that heaven are bigger then the Moon.

Q. What thoughts should the consideration of these wonderful works of the Lord strike into our hearts ?

A. Such thoughts and meditations as David (that great observer of the heavens) had upon this subject. For when he walked out in an evening to contemplate, he looking up to heaven, with admiration, said, "When I consider thy heavens, the work of thy fingers, the moon and the stars which thou hast ordained ;

what is man, that thou art mindful of him ;
or the son of man, that thou visitest him ?

Note here what the Prophet saith, that this great fabrick of the Lord is the work of his fingers ; as if he needed not to have put the strength of his hand or outstretched arm thereunto : so easie it was unto him.

Qu. *Have not the stars in this heaven a motion in themselves, as the Planets have in their heavens ?*

A. They have a proper motion of their own, and move 50 seconds (which is 26851 miles $\frac{1}{3}$) in a year, and but a degree in 72 years ; and in a day, they move 8 thirds & 10 fourths, and perform their whole course exactly in 25 thousand 920 years ; in which time they move 360 degrees, which is their whole circumference, and that amounts unto 696 millions of miles, accounting 1 million 933 thousand 333 miles $\frac{1}{3}$ to a degree in that Sphere. So that these stars are advanced in their course since the time of their creation, which is 5603 years to this present year of our Lord 1654. the number of 77 degrees, 48 seconds, 41 thirds, and 23 fourths ; which comes to 150 millions 433 thousand 83 miles ; which is

is but the $\frac{1}{3}$ part, and a little more, of their whole course and circumference.

And all this is to be understood *in motu rotundo*, that is, in a round or whole motion and number: for there will be fractions, though insensible, yea, and undemonstrable and imperceptible, in those vast bodies, in so great a space of time, let us compute never so exactly or precisely, nay not so much as the smallest sand in an Hour-glass.

Qu. You say, that the daily motion of the stars (which is the proper motion of their own) is 8 thirds and ten fourths: pray how much doth this contain in this heaven where they are placed, and upon the earth, to answer that dimension?

A. That measure in longitude contains in that heaven 73 miles $\frac{1}{3}$. which is upon the earth (to answer the same) but 3 yards $\frac{1}{3}$, less $\frac{1}{3}$ part of a foot; and is the slowest motion of those great bodies in that vast Sphere, as can possibly be (in this nature) demonstrated: which is the main reason it is so many thousand yeers before they can perform their course.

Qu. How

Qu. How is this proved?

A. Thus: First,

A Degree is in $\left\{ \begin{array}{l} 1933333 \\ 32222 \end{array} \right\} \frac{1}{8}$ miles
A Mile $\left\{ \begin{array}{l} \text{that} \\ \text{eighth} \end{array} \right\} \left\{ \begin{array}{l} 32222 \\ 537 \end{array} \right\} \frac{1}{8}$ miles
A Second Sphere $\left\{ \begin{array}{l} \text{eighth} \\ \text{Sphere} \end{array} \right\} \left\{ \begin{array}{l} 537 \\ 8 \end{array} \right\} \frac{1}{8}$

The 8 miles is

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The 8 $\frac{1}{8}$ is

7 $\frac{1}{8}$

The 10 fourths, which
is $\frac{1}{8}$ part of a third, is

1 $\frac{1}{8}$

So that 8 thirds, and 10
fourths, is in that heaven 73 miles.

Secondly,

A Degree upon the earth is 60 mi-
nutes or miles.

A Mile $\left\{ \begin{array}{l} \text{is upon} \\ \text{the earth} \end{array} \right\} \left\{ \begin{array}{l} 5280 \\ 88 \end{array} \right\} \frac{1}{8}$ foot.
A Third $\left\{ \begin{array}{l} \text{the earth} \end{array} \right\} \frac{1}{8}$

The 8 foot is

8

The 8 $\frac{1}{8}$ is

3 $\frac{1}{8}$

$\frac{1}{8}$ foot.

So that 8 thirds and 10
fourths on the earth is 11 foot $\frac{1}{8}$.

Which is 3 yards $\frac{1}{8}$ less $\frac{1}{8}$ part of a foot
(as aforesaid.)

Q. If

Qu. If the stars have such a motion, why are they called fixed stars?

A. They are so called, for that they keep the same position and distance one to another as at the first God created them in : which Solomon knew full well.

Qu. Some suppose that the stars are placed in this heaven, like the knots in a knotty board, or the nails in a cart-wheel; and so are moved according to the moving of this Sphere, and are carried about in their circle, as a man is carried about in a chariot or coach upon the land, or in a ship upon the water. What is your opinion in this?

A. Though a man be in a Coach or Ship, he is not so fastened thereunto, but that he may remove himself from one side, or from one end to the other, in that Coach or Ship wherein he is: which Coach or Ship puts forward notwithstanding the mans motion therein. And so it is concerning the motion of the Stars (in this heaven) which are not otherwise fastened thereunto.

Qu. There are some stars in a clear evening, that seems to shoot from one place to another, or to fall with a wonderful swiftness: what is the reason thereof?

A. They

A. They are not Stars, nor have any part or species of them: but that which seems to fall, is a sulphurous or bituminous matter, extracted by heat and influence of the heavenly bodies, elevated into the higher region of the air; and having not sufficient nutriment being enkindled, and participating of a terrestrial, igneal, aerial quality, seems to come from some star, and fall to the earth; whereas in truth there is no such thing: for the stars cannot fall. But such Meteors as these are called *Stella cadentes*, falling stars, from the resemblance they have to stars, though in reality they are not such, nor hold any considerable proportion with them.

Q. In what time are the stars (by the motion of this Sphere unto which they are fastened) carried about the world?

A. In 24 hours; but not all alike, nor of one swiftness: for those that are in farthest off from the Poles, are carried much swifter then those that are neer the said Poles; insomuch that those stars that are in the middle of that heaven between the two Poles, the most remote, are carried 483 thousand miles a minute of an hour.

Qu. What is the observation of this?

A. * The

*Psa. 147.5 A. * The unlimited power of the Almighty God , who moves this great Orb , with those two greater above it with the same facility , and with as much ease , as he moves the lesser Orbs , or any inmoveable thing under the same , being all alike to him : * for there is nothing too hard for him , how difficult soever it appear to us .

*Jer. 32.17 Q. What may be said of certain stars that are mentioned in the holy Scripture ?

*Job 9.9. as * Arcturus , Orion , and Pleiades

*Ch. 38.31 * Mazzaroth , Arcturus with his sons

*Ch. 26.13 the * crooked Serpent , the * Seven stars

*Amos 5.8 &c.

A. Not troubling you with the interpretation of their names , much less with the profane Poetical fictions about these stars , the best Expositors say that by a figure of speech , putting the part for the whole , under these few being very eminent and conspicuous the rest of the stars are comprehended some being of a constringent or freezing nature , as Orion ; others of a moist nature , producing pleasant sweet showers , as Pleiades , or The seven stars : and so of the rest .

And if we will know the property of these stars , that we may understand these

these places of Scripture, the Art of Astrologie is to be enquired diligently into, as St. Augustine saith, in his exposition of the 38 chapter of Job: but with what certainty, let the Wise determine.

Qu. How far is this eighth Sphere above the Planet Saturn?

A. As far as Jupiter is above the earth, which is 44 millions of miles.

Qu. What distance then is it from the earth?

A. * It is of a wonderful distance *Job 22.11 from us, being 116 millions of miles.

Qu. What then is the circumference thereof?

A. 696 millions of miles.

Qu. What difference is there between the Globe of the earth, and this celestial Globe?

A. The Globe of the earth, to our capacity and apprehension, is a mighty vast and spacious thing, whose circumference makes so many thousand miles, (as is before expressed:) but in the hands of the Creator of it, *it is less *Isa. 40.15 than the least sand, or smallest dust that is.

Now suppose the diameter of the earth (by a Figure) be the 24 part of

the length of a barley-corn, (which is hardly discerned) to answer this dimension according to the aforesaid distance of that heaven from the earth, the semi-diameter of that glorious heaven is 6 yards, 7 inches ; and ; part of a barley-corn ; which is according to that proportion and measure figuratively the distance of that heaven from the earth.

Now as the 24 part of the length of a barley-corn, is to the length of 6 yards 7 inches, &c. so is the terrestrial Globe compared to the celestial ; which, with the compass thereof, is but a very little prick or speck, (though a great matter to us) if it be compared with the bulk or compass of the Starry heaven.

Q. The distance of this starry heaven from the earth is so great, as can hardly be comprehended in the mindes and judgments of most men. For 116 millions of miles is soon spoken, but not so easily understood. Wherefore what familiar example or similitudes have you, to make it more perspicuous and clear, for the better understanding thereof?

A. These three similitudes following, for the present may suffice, viz.

1. Note that so many Peper-corns as

as there are miles betwixt the earth and that heaven, will amount unto 5 Tun^l, 3 C. 2 Q. 7 Li^l and $\frac{1}{4}$ of an ounce.

2. If it were possible that a stome should be let fall from thence, of that bigness and weight, as it should be continually a-falling 150 miles an hour, until it should fall to the earth, it would be 88 years, 3 months, 2 weeks, 4 days, 5 hours, and 20 minutes, falling down from thence to the earth.

3. If *Adam* had lived to this time, which had been 5593 yeers, and had taken his journey from the earth towards heaven, and had mounted every day 16 miles, from the time of his creation to this present yeer 1644. he had been advanced on his journey towards heaven but 32 millions 665 thousand 120 miles : which is 11 millions 336 thousand 880 miles short of the Planet *Jupiter*.

Q. This is enough to startle the judgements of the greatest, wised^t, and most learned men in the world : how then can people of mean capacity judge of it ?

A. Let the meanest capacity, as well as the most judicious, take notice, that this description is not so much for spe-

culation, but rather to set forth the mighty works of the great Architect and mighty Monarch of this immense

* Psal. 89.5 fabrick of heaven and earth, * and to
 * Isa. 57.15 declare his praise, * and to cause men to be more humble, who are so exceeding
 * Luke 12.18, 19. busied, and * careful for the things of this world; as if all their happiness consisted onely in the enjoying of the poor, vain, and superfluous things thereof.

Chap. XVI.

Of the ninth or Crystalline heaven.

Qu. **W**HAT heaven is that which next above the Starry heaven

A. The ninth Sphere; which is called *The Crystalline heaven.*

Qu. *Why is it so called?*

A. It may well be called *The Crystalline heaven*: for the Creator, having made of nothing, within nothing, the principles and grounds of things, made this firmament of water, so perfectly clear and purified as it is: which water

* Gen. 1.6. are those waters * that were divided from the waters under the firmament

which are

which firmament (or heaven of the fixed stars) divided those waters from the waters belowe.

Now those waters * above all the ^{* Psa. 148.4} heavens hitherto described, are clear and transparent as Crytal, thorow which one may see any thing beyond it.

Qu. *What are we to understand concerning those waters?*

A. Note, that in the beginning of the creation of heaven and earth, darkness was upon the face of that unmeasurable depth of waters, under which the earth (as is already alleadged) remained hidden. * The Spirit of God ^{* Gen. 1.2.} moved upon those waters which were separated * and divided from thicke wa- ^{* Ch. 1.6.}ters * which made the sea, and at that ^{* Ver. 10.} time were removed, and lifted up above the Starry firmament into the ninth heaven, * where they remain suspended ^{* Psa. 148.4} by the self-same power that holds all the world suspended and retained by his will.

Qu. *Is this probable?*

A. It is without contradiction, if we consider the universal flood: for Moses saith, that the sluices and flood-^{* Gen. 7.11}gates of heaven were let go: which

could not meerly be understood of the waters in the clouds, but of some other store, surpassing in quantity all humane understanding.

Q. What is the motion of this heaven?

A. It is carried and born about by the tenth heaven in a violent maner, and hath its special motion; by vertue whereof, it carries the eighth heaven but very slowly and leisurely from the west to the east.

Q. What is the distance of this heaven from the starry firmament?

A. In this description of the three heavens which are above the starry heaven, there is no use of Arithmetick for their distance and circumference are not calculated, being a thing beyond the reach and knowledge of all the Arithmeticians and Astronomers that ever were in the world. Yet some are of opinion, that this heaven is as far above the starry heaven, as that heaven is above the earth: and their reason is, because that starry heaven (called the firmament) * God placed in the midst between the waters divided, (as is before mentioned.)

* Gen. 1.16

Qu. What may be the reason that this heaven is placed next unto the first moveable heaven?

A. To

A. To the intent that with the coldness thereof, it might asswage and repress the extreme heat of the same first moveable, which otherwise (as some affir'm) with his swift and violent moving, would set all the heavens on fire.

Chap. XVII.

of the tenth heaven, or first mover.

Qu. **W**hat heaven is that which is next above the Crystalline heaven?

A. The tenth heaven; which is named by some of our modern Astronomers, The great and first moveable heaven.

Qu. What is observed of this heaven?

A. This heaven, continually moving with an equal gait from east to west, doth by reason of its violent swiftness, carry and turn about all the other heavens whether they will or no; so as they are forced to make their own proper revolutions, which are contrary, from west to east, every one in longer or shorter time, according as they be far or neer placed to the same.

Qu. What time bath it in its motion from east to west?

A. It hath one simple, pure, and daily motion, and that in 24 hours, from east to west, between the two Poles, drawing with it all the other heavens, globes, and celestial bodies, yea, the elements also, which are more light and nimble.

Qu. Is it not possible for great and learned Students in this Science of Astronomy, to finde out the height of this great Circle?

A. No: their Telescopes, Optick Glasses, Astrolobes, and all their Mathematical instruments, in this respect are laid aside, and of no use.

Mans knowledge and judgement in this Art, reaches no further then to the heavens where God hath placed those great lights, the objects of their calculations, being visible to the eye.

In those heavens above the eighth Sphere, there are no such lights; and therefore the height of this heaven, the crystalline heaven, and the other above this, * is onely known to the great God
Ch. 48. 13. that made them, and measured them.

Chap. XVIII.

Of the eleventh or Imperial heaven.

Qu. **V**Vhat heaven is that above the first moveable heaven?

A. The eleventh heaven, which divine Philosophers call the Imperial or highest heaven; and some call it the Empyrean heaven.

This heaven is far above all the heavens we have hitherto discoursed of, and comprehendeth them all.

Q. Why is it called the Empyrean, or Imperial heaven?

A. In regard of its brightness and splendor, and because it excels (in purity and clearness) all the other heavens, as the element of fire excels the other elements.

Qu. What may be modestly (without curiosit) conceived of this heaven?

A. This heaven, as our ancient Divines (comparing Scripture with Scripture) do affirm, was created by God the first day that he began the creation of the world, and by him immediately replenished with his ministers and holy angels,

^{Heb.12.}
^{23.} angels, and now is the habitation of Gods elect spirits, where they are gathered, and there attend the rest of their brethren, and the day of the resurrection of the just ; whose bodies being raised from the dust of the earth, shall be re-united to their souls, and carried up into heaven, and there abide eternally with the Lord.

^{1 Cor.15.}
^{42,13,44.} This heaven, being the foundation of the world, is most rare, and pure in substance, most round of shape, most great in quantity, most clear in quality, and most high in place.

Qu. Doth not this heaven move about, as do all the other heavens under it ?

A. No : this heaven is immovable, as the earth is ; so that all the heavenly motions which we see and know, are in that great space between this Empyrean heaven and the earth.

Qu. In the holy Scriptures we read of three heavens, whereas your discourse hath hitherto been of eleven heavens. How is this reconciled ?

A. By those three heavens, are meant those three unmeasurable heavens above the Starry heaven, the highest of which is the aforesaid Empyrean heaven,

heaven, which the Apostle Paul calls
the third heaven, as is observed by ^{2 Cor.}
learned Divines. ^{12.2.}

Chap. XIX.

*How we may conceive of the heavenly
bodies, and their motions.*

Qu. **VV**Hat may those heavenly bodies and motions be compared unto, to bring the knowledge of them more clear to the understanding?

A. They have been frequently compared to the motions of a Clock or Watch, or the like ; in which kinde of Inventions, the Germans have produced very rare and admirable works, as to the motions of the heavens, and heavenly bodies : but nothing (as is conceived) ever did, or can give so clear a light to the knowledge of the hights, distances, and greatness of those wonderful bodies, as the sight of the Spheres themselves, framed and modeled by the Author of this work ; which now remain in my Lord Bacon's Colledge at Lambeth-marsh in the County of Surrey, being truely figured out by the art of

of Arithmetick, and which have been the occasion of this Discourse, that so those Figures, and the heavenly bodies distances and proportions might be truely and justly understood. All which had been here presented and printed in form of a Map, but that the greatness of those heavenly Circles and Bodies, with their vast distances, render them incapable of being represented in the largest paper, though folded never so much; the Figure at Lambeth being the least that can be, and yet is above 20 foot in length.

Qu. What is further to be considered concerning the form and beauty of the aforesaid particular description of the eleven heavens?

A. They are every one so clear and transparent, that to the eye they seem but as one entire body, covering one another, like as if the several scales of an Onion were all of the purest crystal, being every one nevertheless of an exceeding great thicknes.

Thus have you had a brief discourse of the description of the universal world. And yet there are hidden greater things then those. For we have seen but a few of his marvelous works.

Qu.

Qu. How doth the knowledge of these wonderful works of God, advance his glory and praise in the mindes of men ?

A. Certainly, to an ingenious, solid, true Christian spirit, delighted in knowledge, it doth very much. For if the heavens, and glorious lights thereof, be so beautiful, and of such great power and vertue, that with the consideration thereof, the heart is at once both delighted and astonished ; how much more excellent and mightier must he that created them appear ! For whatsoever we have hitherto discoursed of, is but concerning the outside of that high and glorious heaven, where that great high and mighty King, the Lord of heaven and earth, liveth and reigneth for ever.

Chap. XX.

Of what in this life may be known of God ; and of his glorious Throne, or habitation in heaven.

Q. VVhat in this life can be known of God, and of his glorious Throne, or habitation of heaven ?

A. The

A. The wisest of the natural and moral Philosophers, with all their helps whether of Altronomy, Astrologie, and all natural endowments, have been but dark-sighted, as to the solution of this Querie, as all their Writings and Discourses manifest. So that the true answer thereunto, is, that it is impossible for us to know more of God, or of his glorious habitation, then he hath been pleased to declare in his holy Word; wherewith we are to be thankfully satisfied; there being therein so much made known unto us, as sufficeth the humble and meek for their comfort and consolation.

Qu. What briefly doth therein appear, to satisfie such as seek with honest and good hearts, minding the glory of God, and their own comfort, and not to satisfie their vain and fleshly minde?

A. * Moses the faithful servant of God, and meekest man upon the earth, out of his fervent zeal, and purest affection, made the like request unto God himself, saying unto him, * *I beseech thee shew me thy glory.* And he said, *I will make my goodness go before thee, and will proclaim the name of the Lord before thee, and will be gracious to whom I will be gracious,*

* Deut.

3:15.

* Num.

12:3.

* Exo. 33:

from ver. 18. to 23.

cious, and will shew mercy to whom I will shew mercy. And he said, Thou canst not see my face: for there shall no man see my face, and live. And the Lord said, Behold, there is a place by me, and thou shalt stand upon a rock: and it shall come to pass, while my glory passeth by, that I will put thee in a clift of the rock, and will cover thee with mine hand whilst I pass by: and I will take away my hand, and thou shalt see my back-parts, but my face shall not be seen. * And the Lord descended in the cloud, and stood ^{Exod. 34.} with him there, and proclaimed the name ^{5. to 8.} of the Lord: and the Lord passed by before him, and proclaimed, The Lord, the Lord God, merciful and gracious, long-suffering, and abundant in goodness and truth, keeping mercy for thousands, forgiving iniquity, transgression, and sin, and that will by no means clear the guilty: visiting the iniquities of the fathers upon the children, and upon the childrens children, unto the third and fourth generation. And Moses made haste, and bowed his head towards the earth, and worshipped; as being therewith fully satisfied; and which to us is a good example: for, * Whatsoever things were written aforetime, were written for our learning, that we through patience and comfort of the Scriptures might have hope. ^{Rom. 15. 4.} But

* Heb. 12. 14. But if you would know yet more perfectly, * Follow peace with all men and holiness, without which no man shall see the Lord : setting our Lord Christ always before you ; for * in him dwelleth all the fullness of the Godhead bodily.

* Isa. 64. 4. But when you have attained to the utmost this life is capable of, yet this remains as your further comfort, (as it is written) * Eye hath not seen, nor ear heard, neither hath it entered into the heart of man, the things which God hath prepared for him that waiteth for him.

Qu. What a pleasant and precious way is hereby effectually opened, to the most comfortable knowledge of God, and of his love in Christ, which fully satisfieth the former part of the question concerning the knowledge of God ! Pray proceed, and shew us briefly what the Scriptures hold forth concerning his most glorious Throne, and blessed habitation of heaven.

A. The holy Prophet David seemeth in the spirit of prophesie, to have respect unto the most high and holy habitation of the Almighty, saying, * His foundation is in the holy mountain. The Lord loveth the gates of Zion, more then all the dwellings of Jacob. Glorious things are spoken of thee, thou city of God.

* Psal. 87. 1,2,3.

As for the earthly Jerusalem, though it were somewhat better with it in David's time, * and much more glorious in the days of Solomon ; yet the condition thereof was unstable, and subject to many sad alterations, as all earthly cities and things are ; and as Gal. 4. hath it, * For this Agar is mount Sinai in Arabia, and answereth to Jerusalem which now is, and is in bondage with her children. But Jerusalem which is above is free, which is the mother of us all.

But the Revelation of S. John the Apostle, affordeth most for satisfaction in this particular. For, saith he, * I saw a new heaven and a new earth : for the first heaven and the first earth passed away ; and there was no more sea. And I John saw the holy city new Jerusalem coming down from God out of heaven, prepared as a bride adorned for her husband. * And he carried me away in the spirit, to a great and high mountain, & shewed me that great city, the holy Jerusalem, descending out of heaven from God, having the glory of God, and her light like unto a stone most precious, even like a jasper-stone, clear as crystal ; & had a wall great and high, and had twelve gates, and at the gates twelve angels ; and names written thereon, which are of the twelve tribes

* 1 Kings 10. 27.

* Gal. 4. 25, 26.

* Revel. 21. 1, 2.

* Chap. 21. from vers. 10. to 27.

of the children of Israel. On the east, three gates; on the north, three gates; on the south, three gates; and on the west, three gates. And the wall of the city had twelve foundations, and in them the names of the twelve apostles of the Lamb. And he that
talked with me had a golden reed, to measure the city, and the gates thereof, and the wall thereof. And the city lieth foursquare, and the length is as long as the breadth. And he measured the city with the reed, twelve thousand furlongs: the length, and the breadth, and the height of it are equal. And he measured the wall thereof, at a hundred and forty and four cubits, according to the measure of a man, that is, of the angel. And the building of the wall of it was jasper: and the city was pure gold, like unto clear glass. And the foundations of the wall of the city were garnished with all manner of precious stones: the first foundation was jasper; the second, sapher; the third, chalcedony; the fourth, an emerald; the fifth, sardonyx; the sixth, sardius; the seventh, crysolite; the eighth, beryl; the ninth, a topaz; the tenth, a chrysoprasus; the eleventh, a jacinct; the twelfth, an amethyst. And the twelve gates were twelve pearls; every several gate was one pearl. And the street of the city was of

pure

shone gold, as it were transparent glas. And I saw no temple therein: for the Lord God Almighty, and the Lamb, are the temple of God. And the city had no need of the sun, nor of either of the moon, to shine in it: for the glory of God did lighten it, and the Lamb was the light thereof. And the nations of them which are saved, shall walk in the light of it; and the kings of the earth do bring their glory and honour into it. And the gates of it shall not be shut at all by day: for there shall be no night there: and they shall all bring the glory and honour of the nations unto it. And there shall in no wise enter into it any thing that defileth, neither whatsoever worketh abomination, or a lye; but they which are written in the Lambs book of life.

And he shewed me a pure river of water of life, clear as crystal, proceeding out of the throne of God and of the Lamb. In the midst of the street of it, and on either side of the river was there the tree of life, which bare twelve maner of fruits, and yielded her fruit every month. And the leaves of the tree were for the healing of the nations. And there shall be no more curse, but the throne of God and of the Lamb shall be in it. And his servants shall serve him, and they shall see his face, and

His name shall be in their foreheads. And there shall be no night there : and they need no candle, neither the light of the sun : for the Lord God giveth them light, and it shall reign for ever and ever.

You see what a glorious description here is ; so full of variety, worth, and splendor, as if all the excellencies of all the Cities of the whole world were contracted into one, they would fall far short of this, as the glory of the Moon is of the glory of the Sun, as is much shorter. Yet here you have but a description but of one City, the New Jerusalem coming down from heaven. What then, or what possibility is there for any to imagine the most glorious glory of this higher heaven of heaven itself ! Now well may the Apostle

* 1 Cor. 2.9 say, "Eye hath not seen, nor ear heard, nor hath it entered into the heart of man to conceive the things that are laid up for them that love him.

Qu. Here indeed is a divine description of the heavenly Jerusalem, worthy the contemplation of the most holy souls, and therefore such only as are most abstracted from the earth and earthly affections ; and this will be very necessary it be well observed and insisted on, as what is of most attri-

live power, to draw us nearer and nearer unto God. But seeing Arithmetick in all the former Questions hath been of a most beneficial and delightful use, it will be very momentful that thereby also this glorious city may be brought more familiar to every capacity, the same being numbered and measured out by the same measures and numbers as the celestial bodies have been.

A. That shall be done. You are therefore to observe, that the citie lieth foursquare, (as aforesaid) and the length as long as the bredth ; and the measure of the citie 12 thousand furlongs, which is no less in compass then 1 thousand 500 miles ; every square thereof being 3 thousand furlongs, which make 375 miles ; each square being 55 miles or more then the full length of England : the distance between each gate, 1 thousand furlongs, is 125 miles : the thickness of the wall, 144 cubits, which makes 72 yards, and the heighth as much ; which wants but 14 yards ; of the height of Paul's Steeple in London ; and the bredth of the wall on the top the same ; being in every part most glorious, uniform, beautiful, and proportionable.

Chap. XXI.

Instructions from the former Discourse

Qu. **B**eing fully satisfied with your former Discourse, and therefore not desiring to multiply Questions ad infinitum, to the quenching of zeal and affection, which is too usual; but to stop in time, and to be wise according to sobriety: What (for conclusion) do fairly arise as profitable instruction for a sorts of people, from the former Discovery and whole Discourse?

A. Certainly, that which is most wanting in the world, and that is, the strongest motives to persuade unto humility, that ever were brought to light.

* Psal. 8. For alas, * how poor, indigent, and de-
3, 4. Job spicable a thing must man necessarily
25, 6. appear unto himself to be, yea, how even a nothing, when he hath but once considered the immense works of God, thus visibly demonstrated, and plainly calculated, hat he may as it were mea-

* Eccl. 8, 6. sure them out, as with a Rule, in his
Rev. 3, 17 own understanding, men and women
Job 11, 100, though indeed * there be not more
14, 12. weak

weak and wretched creatures living in this world, nor who live more irregularly, vainly, and sinfully: yet how exceeding apt they are, upon the smallest trifling occasions, to swell, and vaunt ^{* Pro. 3.13.} themselves, is as undeniable as shameful. For instance:

* A short-liv'd man, at best, yea, ^{* Psal. 90.} though through age (according to the ^{10.} course of nature) not far from his end, have he but oportunity of high place or power, how doth he in his heart (if not in his tongue) exalt himself, in Nebuchadrezzar's language: * Is not this ^{* Dan. 4. 30.} great Babel which I have built by the might of my power, and for the honour of my majestie? Let such a one now seriously consider what he hath read, or but look upon the Figure in the Sphere, and observe how little the whole earth is, in comparison of the heavens, and how small a Dominion he had, were he Lord of that, whereas what he commands is not in comparison so much as an Ant-hill, * nor himself any other but ^{* 1.3.40.22.} even as an Emmet crawling upon it, and subject upon every accident to be squashed to dirt: and, if any thing, surely this consideration will cause him ^{* 1 Pet. 5.6.} to humble himself under the mighty hand

of God, and not to despise the meanest of mankinde, no not the meanest of Gods creatures ; but to cry out, in the

* Gen. 32. humility of his soul, *Lord, I am *les* then
10. *the least of thy mercies.*

* Jam. 5. 1, * A drudging Worldling, either born
2,3. Luke to land or wealth, got by a father so
12. 17, 18, corruptly, that without repentance
19.

* Hab. 2. 9. went to hell-fire for it, *or who by ex-
action, or oppression, or worldly
mindednes, attains but to some thou-
sand, or but to some hundreds a year
and under the title of Goodhusbandry
or providing for his family, *keeps it
17. together, and heaps up more, though
thousands are ready to starve for want

* Jer 9. 23. of bread ; yet * how apt such world-
Obad. v. 4. lings are to pride and vaunt themselves

* Pial. 49. 6. * and to bear high upon their poor
12. neighbours, all men cannot but know

scorning and despising every one that is
not as rich as they ; puffing and blow-
ing, even with rage, if their wills may
not be their law, and bring all mens
consciences, and persons, and labours,
to their beck. Let such as these take but
a dram of this discourse in three days,
and it will certainly free him from this
mortal disease of his minde. For be-

* Pto. 23. 5. sides that * riches make to themselves
wings

wings and flie away, how small a hand-
ful, in comparison of the whole, doth
he, that hath most, possess? a miserable
small quantity, God knows, for which
yet he is but * a steward to the poor * Luk. 16.2
and needy, and must one day render a
strict account thereof. If this will not
cure him, let him but minde, * *Thou fool, this night thy soul shall be required of thee, then whose shall those things be, which thou hast provided?* and if that cure him
not, he is desperate.

Is any one so simple as to be * proud
of strength? let him set his shoulders
to the ball of the earth that hangs in
the air, and try how he moves it. Better
so, then waste it on as vain attempts, * on
harlots, or in Gambols to shew and set
it out, breaking his bones, and shortening
his days, as if he were not to answer
for that talent, or as if he thought * he
had made himself, * or forgot his Maker * Isa. 100.3
in the days of his youth.

Is any in love with * their own or
others beauty, spending whole nights
and days in contemplation of so airy a
thing, and so proud upon it, as * to disdain
those of another feature; yea, some
so transported therewith, as to turn
their faces from old-age, sickly or hard-
fa-

favoured countenances, making jests, jeers, and songs, of all deformed? Such should compare their own, and those they admire, with the beauty of the Sun, and Crystalline heavenly bodies;

*Psa. 29.14. * the perishing condition of the one,
 * P. al. 72. * and the permanence of the other:
 5, 7. and consider, that neither the deformed
 * Pro. 22.2. nor the beautiful * made themselves,
 * Ch. 16.5. * and that nothing is so deformed in
 God's account, as a proud person, man
 or woman; nor any so beautiful in his
 * Isa. 57.15. sight, as * those that are humble, and are
 Mal. 3.17. careful to fulfil his commandments.

What folly or foolishness is it for any
 * James 2. * to be proud of Silks, Sattins, glorious
 2, 3. colours, spangles, and shining laces! If
 any such there be, (as such weak things
 there are, too many) let them but
 * PsaL 8.3. walk out in a clear night, * and view
 the innumerable glories of the Stars,
 * PsaL 136. and but consider their * magnitude, with
 7,8,9. their * brightness, and, by the help of
 * Ezek. these Rules, but ascend according to
 38.2. Progression, until they come in their
 Dan. 12.3. consideration to the heaven of heavens;
 and then see if any thing about them
 be worth regarding. Certainly they
 must needs see their sensless childish
 folly therein, and for ever abandon it.

Many

Many having passed but some small voyage at Sea, or but traveled by land to *Rome* or *Mexico*, that have seen *Grand Cayre*, or the Country of the great *Mogul*, How apt are such to pride and boast themselves as far-seen men, and to undervalue such as have not ! To cure such, * the consideration of one * *Ps. 19.6.* days journey of the Sun, may more then satisfie.

* Some are taken exceedingly with * *Amos 3.* their own swiftness, others with the ^{15.} speed of horses and other creatures; and being theirs, make a shift to be proud of their excellencies. But alas, what snails are these, to the infinite and unconceivable motion of the heavenly vast bodies !

What bragging and vapouring do we daily hear, about the rarity and variety of Jewels ! * how highly are they prized ! and how are they admired that possess some few of them ! Whenas, if ^{2 Chron. 32.27. Isa. 39.2.} all in the whole terrestrial world were contracted into one, nay, were the whole earth converted into onely one Jewel, and that also of the most desired matter, every capacity calling his eye up towards heaven, discerns at once * *Job 26.13.* * many that in all respects would far *Ch. 37.14.* out-

outvie it. So easily are we puffed up without a cause.

What emulations are there daily amongst men of curious Inventions !

^{1 Dan 4.30} [†] some boasting of this piece of Architecture, others of some admirable Motion; this of a new Engine, the other of another Curiosity: when as all the wonders of man's Invention put together, come not neer what is contained in any one of the fore-going Questions and Answers. The consideration whereof may very well correct the vanity of such mens humours, and draw them to a sight of their folly therein. For though their works are many of them commendable, and deserve to be encouraged, ^{† 1 Mai. 2. 12} yet it is sinful or simple to be proud of any thing.

^{† Jer. 5.30.} ^{Hot. 4.2.} Nay, [†] a horrible thing is committed in the land: for many there are that [†] delight to hear themselves and others, by ^{† 7.} desperate Oathes, Curses, and new-invented Execrations, [†] to blaspheme ^{† 3 Tim. 3. 2} the great God of heaven and earth. O would such but read and consider this Discourse, and but thereby come (as it were) visibly to see the wonderful Majestie of the Lord of heaven and earth, it might be hoped they would be thereby

by so astonish'd, that they would thenceforth † set a watch before the door of † Psa. 141. 3 their lips, and never more be such gross offenders with their tongues, but rather as † Paul, converted by a light from † Acts 9. heaven, of a persecutor † became a 3, 4. Preacher of the Gospel; so these, through † Vers. 20. the powerful influence of divine con- sideration, of blasphemers of God, joyn issue with the Psalmist, and continually cry out, † O ye mountains and all deeps, O † Psa. 148. ye waters that are beneath, and those that 4, 9. are above, &c. bleſ ye the Lord, praise him, and magnifie him for ever: † yea, let every † Psa. 150. 6 thing that hath breath praise his holy Name.

The great † Nimrods and men-hun- † Gen. 10. ters of the world, that for their own 8, 9. ambitious end: † make no conscience † James 4. or scruple to raise quarrels and dissen- 1, 2. tions, turning whole cities and coun- tries topsie-turvie, † rejoicing & taking † Psa. 68. pleasure therein, as did that prosperous 30. thief, (as one justly calls *Alexander the Great.*) Such as those will finde by this Discourse, that there is a greater then they, † before whole judgment-seat they † Psa. 95. 3 must one day † give an account, when † 2 Cor. 5. the meanest they have murdered and 10. Rom. destroyed, will be in a better condition. 14. 12.

And

* Psal. 28.3 And * the great contriver of mischief,
 * 1 Tim. 6.5 * that turns godliness to gain, and
 2 Pet. 3. makes merchandise of the Word of
 1,2,3. God; that belyes the heavenly influen-
 * Rev. 20.4. cies, and deludes the world; * that per-
 * 1 Tim. 4.1. secute and asperse those that will not
 1,2. receive the mark of the Antichrist, and
 * 1 Tim. 4. of their false Prophet, * that make no
 1,2. conscience of their ways at all; hearing
 or reading this discourse, will finde a
 cure for their Atheism, a conscience
 within them, whether they will or no,
 * Psal. 48.11 that will enforce them to confess, * that
 there is a reward for the righteous, and
 that there is a God that judgeth the
 earth.

And for those that have escaped the
 * 2 Cor. 7.1. * filthiness of the flesh and spirit, though
 * Mat. 8.20 they are such as * like their Lord and
 * Neh. 4.4. Master, have not a house to put their
 * 2 Cor. 4.17. heads in, * though they are desolate, de-
 spised, and forsaken; yet knowing their
 short afflictions are but for a moment,
 and that there is laid up for them in
 the highest heavens an eternal weight
 of glory; And if they posses the pre-
 sent greatness, power, and glory of the
 * Isa. 34.4. men of the world, * yet it being fading
 * 1 Chron. 29.15. and transitory, and knowing that * here
 is no abiding place, they are to satisfie
 their

their souls with this, * that they are not ^{Matth.} to set their affections on the corrupti- ^{6. 19.}
ble things of this world, where the rust
and moth doth corrupt, and where
thieves break thorow and steal, * but ^{Vers. 20.}
to lay up their treasure in heaven,
where neither rust nor moth doth cor-
rupt, and where thieves do not break
thorow nor steal; and where they are
certain to be ^{Heb. 12.} free citizens of the hea-
venly *Jerusalem*, whose builder and ^{22. Chap.}
maker is God, * in whose presence ^{11. 10.}
^{Psa. 16. 11.} there is fulness of joy, and at whose
right hand there are pleasures for ever-
more. And thus shall it be with them,
when those who here in this life ^{Luke 16.} have
been clothed in purple, and fared deli- ^{29.}
ciously every day, shall (with the hypo-
crites) scorch and burn, * and cry in tor-
ments for lack of a drop of water to ^{Vers. 24.}
cool their tongues.

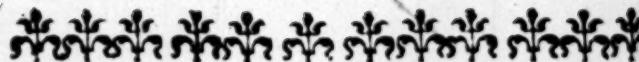
These, and the like, are the proper
fruits proceeding from this well-
meaning Discourse, wherein eve-
ry man may vary according to his
own genius, and necessity of oc-
cation.

And that it may have plentifully such
happie and desirable effects, The
Al-

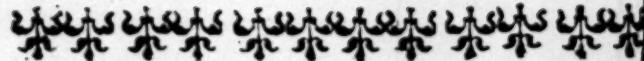
Almighty God in mercy blesſ it to e-
ry man, weman, and childe, that ſhall
be any way partaker thereoſ. *Amen.*

Laudate Dominum.

*Admiremini omnia Opera ejus,
Et Verbo ejus contremiscite.*



FINIS.



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Of the 9 or crystalline heaven, why so called: what we are to understand of the waters in this heaven. What the motion of this heaven is; its distance not to be found: a reason why this heaven is placed next the first moveable. P.84,85,86.

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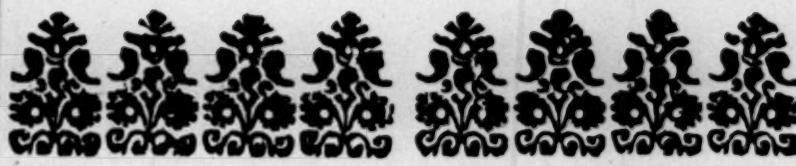
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Chap. XXI.

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That the weak Traveller in this his Celestial progress may not stumble, or be at a stand, I have made the way somewhat smoother, by the explication of some words not familiarly used, which he may meet withal in the precedent Discourse.

A

Afflux, a flowing together.

Astral, belonging to the air.

Animals, those things that move upon the earth, and have besides Augmentation, either Sense only, or both Sense and Reason; as all kinde of Beasts, and Man.

Antipodes, people dwelling on the other side of the earth, with their feet against ours.

Apogea, a point in the heaven, when any Planet is furthest from the Centre.

Apogetety, furthest distant from the earth.

Approximation, a drawing neare.

Archimedes, a Geometrician of wond'ful skill.

Architect, a Builder, or chief Workman.

Aries, one of the twelve Signes.

Artifice, the skill or ability of an Arts man.

Aspect, its form and figure which it sheweth to another body.

Asperse, to sprinkle, besprinkle.

Astrolobe, an Instrument whereby the motion of the Stars is gathered.

Astrologie, a Science teaching the knowledge, vertue, and influence of the Stars.

Astronomy, a Science teaching the knowledge of the courses and motion of the Planets and Stars; and their distance, greatness, and form.

Atome, any thing so small, that it cannot be made less.

Attractive, having power to draw.

Attrition, rubbing of two solid things together.

Axletree, an imagined Line from the one Pole to the other, drawn thorow the Centre.

B.

Basis, a foundation.

Benign, gentle, favourable, friendly.

Vitumenous, an oily substance quickly taking fire.

C.

Calofacion, heating.

Cancer, one of the twelve Signes.

Capacious, large, containing much.

Capricorn, one of the twelve Signes.

Celestial, heavenly.

Character, a mark, signe, or description.

Circumference, a Circle, whose every part is equidistant from the Centre.

Circum-

Circumvolution, a turning or wheeling about.

Circular, that which is round in compass.

Claritude, clearness.

Climate, a particular situation of any Country, in reference to the Poles and Equator.

Cohibition, a letting or forbidding to go.

Columns, pillars.

Combinations, a joyning or confederating together.

Compression, a pressing or thrusting together.

Compused, accounted or calculated.

Conjunctive, which knitteth or fasteneth together.

Conspicuous, easie to be seen.

Constellation, a certain number of Stars making up a certain Figure given unto it for distinction-sake.

Cosmography, a description of the whole world.

Constringent, binding, as frost bindes the water.

Cubit, the length of the bend of the arm to the end of the little finger, which is a foot and a half.

D.

Dædalus, a famous Artificer, the father of *Icarus*.

Degres, a Degree is 60 minutes or miles; and in the heavens it is the 360 part of the Zodiack.

Demonstration, an eminent and uaderivable manifestation of any thing.

Demonstrative, that which declareth any thing evidently.

Despicable, a thing to be despised.

Dextrous, nimble, skilful, quick.

Diæ

Diameter, thickness, or a strait line passing between the middle of a Figure, dividing it into two equal parts.

Diametrically, in a direct line.

Dictate, to endite what another writes.

Digits, Figures in Arithmetick.

Digression, a going from the matter in hand.

Dimension, a true measuring of a thing.

Diurnal, daily.

Dragon, a Constellation so named.

E.

Eclipse: interposition of a dark body between the eye and a light body.

Ecliptick Line : a Line in which the Sun always keeps his course : which Line runs thorow the middle of the twelve Signes.

Efficient cause : that makes or produceth any thing.

Ela : the highest Note in the Scale of Musick.

Elemental : belonging to the Elements.

Elliptical : belonging to a crooked line.

Emanation : a flowing from any thing.

Empyrean : the highest heaven above the firmament.

Endenized : made free.

Epitome : a short gathering of a matter in writing.

Equidistant : of like distance.

Essentially : of the nature or essence of a thing.

Evince : to clear by argument.

Eccentricity : not having Centres alike.

Errhalations: a sumy smoak hot and dry, drawn out of the earth by the heat of the Sun, or other Stars.

Ecstasie: a trance, or astonishment.

Extraction: drawing forth.

F

Furlong: a measure used in Geometry, eight of which make a mile.

G

Genuine: true and natural.

Genius: a term arising from the supposition of every mans having a Guardian-Angel taking particular care of him, called his *Genius*. Others conceive it to import no more but the inward motions and suggestions of a mans spirit.

Geometry: one of the seven Liberal Arts, converstant about measuring the earth, and proportioning Figures.

Globe: a round bowl, or the description of the world made in such a form.

Globous: round as a Globe.

Gradations: a going by steps.

Gradually: by degrees.

H

Habitually: arising from a habit, begotten by frequent actions.

Hemisphere: that part of the heaven which is still to us visible.

I

Igmeal: or fiery.

Illas

Illuminated: enlightened.

Imagery: painted, or that which is conceited in the minde.

Immaterial: without matter.

Immense: that cannot be measured, or that is of vast extent.

Imperceptible: not to be perceived.

Imperial: imperious, stately, Lordly.

Impressions: figures or representations of things appearing in the heavens, clouds, &c.

Impulsion: a forcible motion from another.

Incounter: most in opposition.

Influence: a flowing in; power which Planets and Stars have over inferiour things.

Inherently: grounded in the substance of accidents.

Interposing

Interposition { putting or coming between.

Interposure

Intrinsicall: that which is within, or belonging to the essence of any thing.

Irregular: out of order or course.

L

Lares: Tutelar-gods, that were protectors of a family.

Libra: one of the twelve Signes.

Locality: the place of any thing.

M

Magnitude: greatness.

Mathematicks: the Arts of Arithmetick, Musick, Geometry, Astronomy, Astrologie, and Cosmography.

Marine : a plain and allowed position in any Art.

Meridional : belonging to the Southern noon-tide.

Meteoz : an elementary body ; as snow, hail, clouds, windes, blazing stars, thunder, lightning, &c.

Million : a thousand thousand.

Minerals : hard and compacted bodies digged out of the bowels of the earth ; as lead, tin, iron, &c.

Mutation : changing.

Mutation : borrowing.

N

Nadir : the opposite point of the heaven under us.

See **Zenith**.

Notion : a term for the better understanding of any thing.

Numerous : many in number.

Nutritment : or nourishment.

O

Oblique : crooked, or a slope.

Obliquely : crookedly.

Obliquity : crookedness in ascent or descent.

Obsequious : dutiful.

Obvious : met in the way, or easily understood.

Occult : hidden.

Opacious : thick and dark, opposite to transparent.

Optick-glass : a trunk-spectacle, a prospective-glass, bettering the sight.

Orbs : round Circles, or the heavens where the Planets and Stars are.

Orbicular : round like a Circle.

P

Parallel : lines equally distant.

Parallax : the distance between the site of such Planets in reality and in appearance.

Penetrate : that pierceth.

Percolated : strained.

Perfidious : full of treachery.

Perigeiety : the neerest distance to the earth.

Perigeeum : a prick or point of greatest neerne of any Planet in its approach towards the earth.

Periodical : that observes certain periods, course or changes.

Permanence : permanent, long enduring.

Perpendicular : directly downright.

Position : a setting, placing, or being of any stet.

Posture : as position.

Posthume : brought to light after the death of the Author.

Predisposition : the disposition or aptnes of the matter beforehand.

Profundity : depth.

Progression : going forward.

Projected : contrived.

Propinquity : neernes.

Q

Quondam : in times past.

R

Radiation : a shooting or darting of beams, spiss or light ; or the aspects or rays which the Sun and Planets have to one another.

S

Kapid : violent whirling about.

Receptacle : that which receives another.

Refler : a darting back again.

Reflexion : as reflex.

Repress : to beat or keep down.

Revolotion : returning to the same point.

S

Hemidiameter : the half of the diameter.

Hemicircle : the half circle.

Herene : clear.

Signe : a Signe is the twelfth part of the Zodiack, which is thirty degrees.

Solstice : the two extreme points which the Sun passes North and South.

Solution : a payment, or an expounding.

Species : or kinde.

Sphers : a round circle, commonly taken for the round circled compass of the heavens.

Spherical : belonging to the Sphere.

Spherometry : the art of measuring the Spheres.

Stabiliment : foundation.

Station : a standing.

Sublunary : under the moon.

Sulpherous : or full of brimstone.

Superficies : the utmost face or lines of any body.

Supinest : most neglectful.

Surface : as superficies.

Suspended : hung in equal poise.

Sympathy : mutual affection.

Sympoms : any grief following a disease, or sensibly

bly joyned with it ; as Head-ach with an Ague,
&c.

T

Telescope : a glass by which things may be plainly seen at a very great distance.

Tendency : a tending towards any thing.

Tercrestrial : earthly.

Termination : the ending of any thing.

Thirds and fourths : note that a degiee is 60 minutes or miles : a minute is 60 seconds : a second is 60 thirds : a third is 60 fourths. So 10 fourths is $\frac{1}{6}$ part of a third.

Torrents : a forcible motion of the waters.

Transparent : which may be seen thorow, or clear.

Tripod : Three-footed.

V

Variations : changes or alterations.

Vegetables : those things that spring up from the earth ; as plants, herbs, trees, &c.

Vicinity : neerness.

Vertical : the point of return.

Vivid : lively.

Vivification : making alive.

Undemonstrable : that cannot be made plain.

Z

Zenith : that part of heaven which is right over our heads. And that part opposite to the Zenith under us, is called Nadir.

FINIS.

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